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November 12, 1931

A 4 m.g.d. Emergency Water Supply in 70 Days

Unemployment Relief at Milwaukee and Spokane

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Sixty-Inch Cast-Iron Pipe for Atlantic City Water

Development of the Submarine Rock Drill

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Stringing Rope-Strand Cables for St. Johns Bridge

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Laying 60-inch cast-iron pipe for Atlantic City water supply

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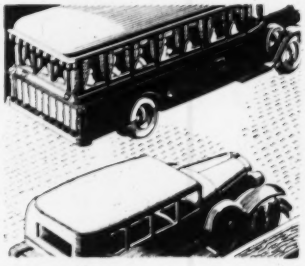

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(Complete details of the construction of the Akron-Canton super-highway will be sent on request)

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ENGINEERING NEWS-RECORD

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F. E. Schmitt, Editor

NOVEMBER 12, 1931

Professional Solidarity Made Real

THE following report, which might have come from many a city, is printed with actual details taken from New York. It offers a practical demonstration of helpful fellowship among engineers.

"There are only two kinds of engineers today," said a speaker at a mass meeting held on Monday by the Professional Engineers Committee on Unemployment of the New York Metropolitan District, "the lucky and the unlucky"—meaning, of course, the employed and the unemployed, who differ not in merit but in good fortune. To equalize this fortune, to save their unlucky brothers from undeserved hardship, and to conserve great assets of engineering ability that are in imminent danger of being destroyed, the local sections of the four national societies joined to form that committee as a working agency of mutual aid. Their action for the first time in local history is awakening a real consciousness of engineering fellowship and converting professional solidarity into fact.

OUT of more than 10,000 engineers in the metropolitan district, some 2,000 are unemployed. These men range from draftsmen to executives, from those who have been idle a month to others out of work two years. Many have consumed all their assets and are now in immediate need. Detail is needless; the story is the same the country over.

Conditions have been acute since midsummer, more acute since early fall, and are daily becoming worse. The employed engineers have therefore undertaken to see their fellows through the winter: to find work for the unemployed colleague if he is fit, to advance him a loan if necessary, to provide direct aid to those temporarily incapacitated.

SIMPLICITY, direct action and close cooperation with existing relief agencies are the keynotes of the engineers' organization. Discarding ideas of an elaborate organization, the engineers who have taken the planning in hand have resolved themselves into three compact groups, an executive committee, a committee on finance and a committee on relief work. The first-named is in charge of general planning and of administering relief; a subdivision has already set up the nucleus of an operating organization, with an office in the Engineering Societies Building, where men are now being registered. The finance committee has named the United Engineering Trustees, Inc., as treasurer, thus avoiding the necessity of setting up a separate body to receive and administer funds. This committee has borrowed from the local section of the civil engineers $1,000 of its reserve fund for immediate needs, and is now issuing a call to employed engineers within the district to contribute a definite amount of their income during the winter months.

THE relief work committee has the function of finding the jobs. Its main groups deal with statistics, planning, and clearance, the latter to tie in with the work of existing relief agencies. In the planning of relief work for engineers this committee is to cooperate with the general emergency unemployment group, known as the Gibson committee, in developing "made work" for the employment of large numbers of people, in the effective presentation of the need for that work to the proper authorities, and in providing plans and direction. The heads of the chief city departments doing construction work have been called into council.

Already some county and city departments have put emergency forces to work. Westchester County, part of the district, has taken up mapping and preparatory planning that will not be needed for several years but can usefully be done now. Public institutions have found use for groups of men to carry on some long-delayed research and classification. Private organizations, despite their need for rigid curtailment of expenditures, have been able to start some studies and operations known to be needed at a later time. Thus individual results of tangible nature are already apparent.

THE aim of this movement is to direct the energies of engineers with jobs to conserving the ability and upholding the morale of their fellows who are without jobs. Municipal relief agencies are inadequate for this in that they cannot provide relief until a man is destitute, a condition in which his morale is at low ebb.

In administering the work all distinctions as to society membership disappear. All are engineers, be they members of the civil, mechanical, electrical or mining corps, or members of none of the directing engineering organizations. A man needs but to show that he is an engineer to get help. Here is a professional solidarity at its best. As is so often the case, adversity has shown the way toward developing the strength of united action.

THERE is an amazing unanimity and strength of purpose back of the undertaking. It was fully evident at Monday's mass meeting, and no doubt remains that the profession is a unit throughout the district in the effort to pull through the emergency jointly, and that it will find the money, the work and the generalship needed for the task.

EDITORIAL NOTES

No Hibernation

A MORATORIUM on private building such as was declared during the war period may be justified as a war measure, but declaring a moratorium on building now, as has been proposed in New York, because some believe there is an excess of certain types of buildings, has no conceivable justification. The purpose of the war-time moratorium was the immediate conservation of men and materials for war work. The purpose of the proposed moratorium is the remote and uncertain one of improving conditions in the building field at the end of a three-year period—presumably for those builders and dealers who survive the moratorium period. Such a proposal is sure to fail, primarily because it is an attempt on the part of a few to dictate how others shall spend their money. We have had our fill of tampering with natural processes. Ice packs should not be applied to the building industry to slow up its normal recovery from the depression in the hope that it will be improved by a three-year period of hibernation.

Speedy Relief Work

ON NOV. 3, just a week after a favorable vote was registered on a $600,000 bond issue for a storm sewer in Salt Lake City, contracts were awarded for the construction of part of the work. This speedy authorization indicates what officials can do in the way of cutting red tape and expediting public work when the incentive is great enough. As a consequence 5,000 jobless citizens will begin to receive relief at a time when construction can be carried on without the hampering effect of inclement weather, though it is proposed to carry on throughout the winter. The case is a tribute to the engineers and other officials, for final plans for the sewer work were drawn and bids were asked even before the bonds were authorized. It is in line with what the city is doing in other respects to make all its citizens self-supporting this winter. A definite tie-up between unsalable farm surpluses and food shortages in the city has been established by the city's system of work certificates that are exchangeable at city warehouses for donated food and clothing in lieu of pay on projects for which funds are not available. The city's jobless are now gathering the surpluses from near-by farms, and cattle donated by ranchers are being slaughtered for meat. Such spirit harks back to the days of the pioneers and should serve as an example to those cities in which dole-like handouts are the sole form of unemployment relief.

Prices Are Rising

COMMODITY PRICES are rising. The forward movement has proceeded for two weeks at sharply marked pace, but its origin goes back considerably farther. Up to now the grain and cotton regions are the principal direct beneficiaries; indirectly the gain carries over the whole country, through strengthened credit and improved purchasing power. The background reason is depleted stocks, according to *The Business Week's* analysis of the remarkable development; but the immediate reason is a changed outlook, a new business optimism. Depleted stocks have been a reality for months, but their influence could not overcome the demoralized fears of producers. Now that most people have become hardened to these fears, the facts of the situation are seen in true proportion. The resulting improved mass psychology in the commodity markets is the first significant change in business spirits for a long time. Present forecasts are that sharp fluctuations of the price movement may occur in the near future, but only as an incident of the upward progress. At the same time it is reasonably certain that the hopeful outlook will extend to other fields, the more so as the present price increases have an influence far beyond the commodities directly concerned. In due course, therefore, we may expect to see the prices of construction materials move upward, both because of the new outlook and because hand-to-mouth production has long prevailed. Further, it is generally realized that prices below cost have helped no one, which knowledge will cooperate with the changed market outlook. Altogether, rising markets are ahead, and construction is likely to feel their effects before long.

Lasting Achievement

SAMUEL W. STRATTON, who died three weeks ago deserves to be long remembered as the creator and organizer of the Bureau of Standards. What he wrought in the early years of the century, when the bureau was established and its great group of buildings erected, and in the subsequent years during which the organization was assembled and policies were established, remains today the principal determinant of the status and achievements of that remarkable governmental institution. It has served industry and science not only in the United States but in the world; it has strengthened and aided the work of the school scientists, has advanced engineering by contributing fundamental data, and has helped to modernize probably every branch of industry. Much of the credit for these achievements is due to the broad conception of the institution's purpose and functioning which Dr. Stratton established. Another large share must be attributed to his far-seeing policies of management, which held a well-adjusted balance between the long-haired scientists and the mercenary industrialists. That this is not all of the story is clear to anyone who has followed the bureau's progress in the years since Stratton left and George K. Burgess took up the reins; the work of these latter years too engages respect and praise. Yet even today it is Stratton's fundamental concept on which the bureau's effectiveness is founded. Science may not list him among its great discoverers, but it does owe him a debt for what his promoting and organizing ability achieved.

Rope-Strand Cables

SINCE factory-stretched wire strands were first introduced three years ago for the erection footbridges of the Hudson River bridge at New York, their use in the main cables of suspension bridges has steadily increased. A 949-ft. span in Quebec, a 1,200-ft. span in Portland, Ore., and a 1,060-ft. Ohio River span at Maysville, Ky., are among the major structures completed. Designs for the projected Shelter Island bridges on Long Island, N. Y., also include strand cables for the 1,100- and 700-ft. suspension spans. No better current example of the effect of industrial developments on civil engineering advance exists than the successful prestretching of wire-rope strands to give them a high modulus of elasticity. Some of the very early suspension bridges used wire

ropes, but the tendency of ropes to stretch doomed them when a method of spinning parallel-wire cables in the air was perfected. The rope-strand cable, however, holds a great theoretical advantage over the parallel-wire cable in the ease and speed with which it may be erected. To attain this advantage, some parallel-wire cable strands have been manufactured on the river bank instead of in place in the bridge, the most notable recent example being the Ohio River bridge at Portsmouth, built in 1927. But with the completion of the St. Johns bridge at Portland, engineers are afforded the first opportunity to study the erection of a rope-strand cable bridge in detail.

A Challenge to Railroad Men

ALMOST unusual feature of the Interstate Commerce Commission's statement denying a uniform general rate increase to the railroads is its thinly concealed indictment of the executives of our great railway systems for their lack of sound business judgment and for their action in obstructing the orderly procedure of the rate increase case. A few extracts from the commission's findings are pertinent.

First, in reference to obstructing the inquiry by withholding needed information, the commission says: "Reliance upon the judgment of the executives as to the revenue effect of an increase in rates is much weakened by their failure to adduce any substantial reasons for their judgment and the definite withholding of the best available information on this point. In several instances they refused to produce traffic officers whom protestants wished to call to the stand."

This is a rather grave charge. But the commission proceeds to a more direct attack in charging the railroads with lack of judgment and progressiveness. It says: "They have in the past occupied the field with sufficient exclusiveness so that, apart from competition with each other, their habits of thought are not so well adapted to facing and meeting new competitive conditions. . . . That waste can be minimized we have no doubt, but that this will require a greater degree of cooperation than the railroad executives have yet been willing to put into practice is plain. . . . At a time when as an industry they have new enemies to face, their warfare with each other has grown more bitter, so that economies in operation have been offset in part by the growth of competitive waste." Losses due to competition for passenger business are cited by the commission as typical examples of such waste. It points out that were it not for the failure of the passenger business by something like $450,000,000 to contribute its proportionate share toward taxes and return upon railroad property the railroad companies even in this depression would be earning enough to stabilize their credit. And competition among railroads for passenger traffic continues to increase in intensity.

This indictment is too specific to be overlooked. By raising question as to the ability of the executives of our major railroads to meet the newer forms of competition, it causes the public to wonder whether the railroads actually need higher rates or whether they need them only because their managers refuse to face conditions as they exist today.

We doubt that ability to adapt railroad practices to present-day conditions is lacking among railroad officials. A few outstanding examples of its presence preclude such a sweeping conclusion. But the leaven of such unfettered thinking is small. Many railroad men are unable to think in terms of buses, trucks, demountable truck bodies, container cars or barges as adjuncts to railroads; too many believe that what has been must be and refuse to abandon services or practices that have become or soon will be obsolete.

Unless such men cast tradition to the winds and show that they still have capacity to think and act constructively, the industry will find the public accepting the Interstate Commerce Commission's indictment of its present leaders. How constructively these leaders meet the commission's present proposal for a pool to aid roads in financial difficulties and how generally they accept its charge to restudy and revise their rate structures to meet present-day conditions will indicate whether they are real leaders or just empty shells from which the capacity for leadership has departed.

The railroads have good reason to be proud of the record they made in increasing their operating efficiency in the years since the government turned their properties back to them after the war; but that may be characterized as progress along natural and more or less obvious lines. The challenge of recent developments which is epitomized in the I.C.C. findings is to be met only by thinking along new and broader lines. It stands on a par with the challenge of the Rocky Mountains to the railroad builders of a half century ago. That it will be met we have no doubt, but upon how soon it is met will depend in large measure what position the railroads will occupy in the coordinated transportation system now developing.

Bid Shopping

LAST WEEK'S remarks on the difference between structural steel men and general contractors with respect to shopping for bids touched only one of many instances of the bad practice. While these remarks were being written, the same subject of bid shopping was under sharp discussion among building interests.

Architects, general contractors, subcontractors and material men met under the ægis of the New York Building Congress to adjust their differences, but they were far from agreeing. The picture of the situation as developed is worth considering. The contractor, after taking bids from subcontractors, often discounts their quotations in making his final bid to the owner or architect, and in any event after getting the job he usually carries on some aggressive shopping to force down his subcontractors' figures. The owner and architect also shop, by pitting one general contractor against the other to bring down bids already made. The subcontractor often shops just as insistently among the material men. But in many cases the blame does not rest wholly on the shopper; those who have bid to him often solicit an opportunity to revise their bids and meet or underbid their competitors.

Thus all parties share in the blame. They would like to get rid of the practice, knowing that it means lowered quality and poor business. It can be eliminated by establishing firm bidding as a fundamental element of professional ethics in the building field and by branding violations as unfair trade practice. Before this is possible, however, the complaints and views of the different parties need to be fully discussed and adjusted, or the motive causes of bid shopping will remain. And so long as they do, price will govern and quality will suffer.

Emergency Water Supply of 4 m.g.d. Completed in 70 Days

Lexington, Ky., forced by drought to construct 7-mile pipe line to Kentucky River, new power line and two pumping stations

By A. D. COUCH
Mechanical Engineer, Community Water Service Co., New York City

A 7-MILE PIPE LINE bringing water from the Kentucky River was completed and placed in operation within 70 days in order to relieve an impending water shortage at Lexington, Ky., during the closing months of 1930. Preliminary surveys for the supplementary supply were begun on Sept. 25, 1930, when the rainfall deficiency since the beginning of the year had amounted to more than 10 in. and only four months' supply of usable water remained in the four reservoirs of the Lexington Water Co. Low-lift pumps, housed in a wheeled car to provide for a 40-ft. variation in river stage, draw the water from the river and deliver it through a 12-in. galvanized line to the high-lift pump. The water is forced up the 375-ft. steep bank of the river through a 20-in. welded steel pipe, laid above ground. The remaining 36,000 ft. of the new line consists of 20-in. cement-lined cast-iron pipe.

The main pumping plant of the Lexington Water Co. is 3 miles southeast of the center of the city, where there are three impounding reservoirs, Nos, 1, 2 and 3. These reservoirs contain approximately 885,000,000 gal. (885 m.g.) when filled. A fourth reservoir still farther from Lexington, about 3 miles from the main plant, has a capacity of 880 m.g. A 16-in. line connects the No. 4 reservoir with the main pumping plant. The water shed of No. 4 is separated from that of Nos. 1, 2 and 3 by a ridge, and it is therefore necessary to pump water from No. 4 to the sedimentation basins at the main plant. The watershed of reservoirs Nos. 1, 2 and 3 has an area of 4 square miles, and No. 4 has an area of 9 square miles. The Kentucky River makes a long bend towards the city of Lexington with its nearest point 7 miles from our system.

The year 1930 started with reservoirs only partly full. During the late spring, summer and early autumn the falling reservoirs were a source of great worry. On July 1 the rainfall was 5 in. short. The season was exceptionally hot and lawn sprinkling was enormous, with no rain in sight. By Aug. 1 the rainfall was 10 in. short and the operating force had one eye on the falling reservoirs and the other trained to the sky looking for a possible cloud. It seemed almost unbelievable that the drought could continue, but plans were considered for obtaining water from the only other source available, the Kentucky River.

It was finally decided that perhaps the situation could be saved by advising the people of Lexington that water should be conserved as much as possible, and that by their voluntary aid this saving could be accomplished. Some help was obtained by this method, but by September it was evident that drastic steps would have to be taken, for the rainfall at that time was more than 10 in. short and the reservoirs contained but four months' supply. It was obvious that any emergency supply would have to be completed before that time expired. There now began to be conferences with the city authorities to decide what could be done, and an ordinance was passed on Sept. 20 prohibiting lawn sprinkling and the washing of automobiles.

On Sept. 25 it was decided that the emergency supply

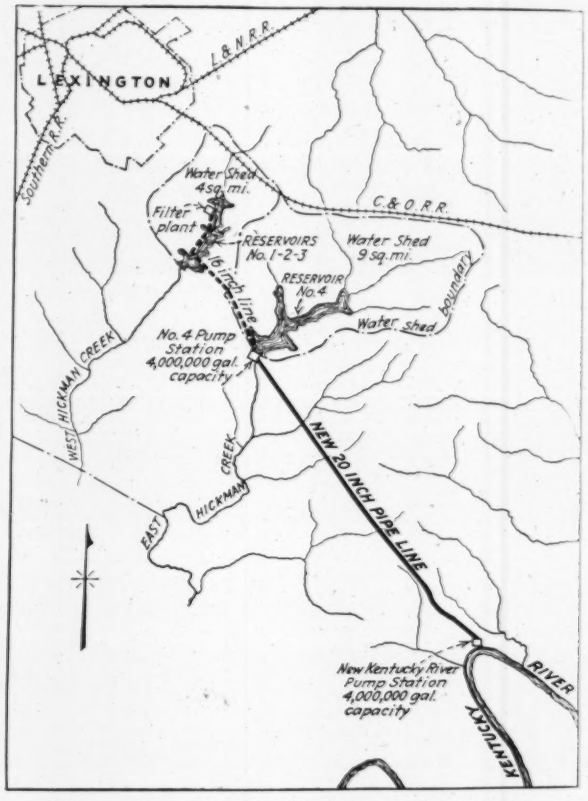


Fig. 1—New 20-in. pipe line brings water from the Kentucky River by the shortest route

needed, 4,000,000 gal. per day (4 m.g.d.), must be obtained from the Kentucky River, and active work was started on a survey between No 4 pump house and the river.

It was thought that water could be obtained by Dec. 1. This, of course, was a very short time, considering that a complete survey was necessary, showing several different possible routes. After the best route had been selected, rights-of-way had to be obtained, then the engineering had to be taken care of, the construction material ordered, and the work performed.

The route selected contained 5 miles of fairly good digging and 2 miles of rock, the latter at the river end.

Where the line reached the river the bank was very steep and rocky, with the top about 375 ft. above the normal water level. The profile of the bank showed one slope, beginning at the top, at an angle of about 45 deg. with the horizontal; a second at 60 deg. and a third at about 35 deg. The river at that point has a maximum rise of approximately 40 ft. Fortunately, a location was found for the new pump house almost directly under the point where the line reached the river.

It was decided that the pipe line should have an ultimate capacity of 6 m.g.d., but for the present 4 m.g.d. was all that would be required. This line had to be 20 in. in diameter, and as the pressures to be encountered between the top of the river bank and the No. 4 pump house would be considerably less than 100 lb. per sq.in., it was further decided that centrifugally cast pipe should be used, cement-lined. After considerable thought a decision was made to use steel for the line between the pump house and the top of the river bluff. It was believed that considerable trouble would be encountered in handling heavy cast iron, which would be needed due to heavy pressures, and that it would be very hard to support and anchor properly a line made of cast iron. Further, the bends encountered could be more easily taken care of in a steel line than in one of cast iron.

Mention has been made of the rivers' rising 40 ft. without much warning. Several methods were considered to overcome this situation. It was finally decided that the floor of the pump house should be located 43 ft. above the pool stage of the river (controlled by government navigation dams), and that an industrial railway from the water's edge to the main pump house should be constructed and have erected on it a movable low-lift pump house.

As our Lexington crew was busy on other new construction work, the work of installing the pipe line was given to outside contractors, but the supervision of the work, of course, was under a representative of the company. This procedure relieved the company of purchasing or renting additional or special equipment necessary for a quick job of this nature.

Several methods of driving the pumps were considered, such as gasoline engines, diesel engines, a steam plant or electric motors. After weighing the various costs of these different kinds of motive power, the decision was made to use electric drive and to build an 11,000-volt electric transmission line 10½ miles long from a substation near the main pumping station to the bluff at the top of the river. At the river bluff a second substation was erected to transform the voltage from 11,000 to 2,200 volts, and a line at the lower voltage was carried down the face of the bluff to the pumps located beneath. The 11,000-volt transmission line was erected on wood poles 35 ft. in height with wood cross-arms, using the flat-arm construction. The wire used was No. 0 aluminum and was spaced 35 in. between phases.

It was determined that about 600 kva. would be required, and there were, therefore, installed at the sending end of this transmission line three 200-kva., 66,000- to 11,000-volt, single-phase transformers, and at the receiving end three 11,000- to 2,200-volt, single-phase transformers of the same capacity.

The erection of the substations and transmission line was let out to the local electric company, as it was in a good position at that time to install the equipment with the least possible delay. All manufacturers supplying material and equipment understood the necessity for prompt shipment, and the first pipe arrived in Lexington on Oct. 15, and the pipe manufacturer agreed to furnish at least 125 lengths per day thereafter.

Fig. 2—Low-lift pump house is movable to provide for a 40-ft. rise of the river

House is mounted on wheels running on an industrial track. Heavy rubber hose serves as a discharge connection for the pump.

Excavation work had been started some time before that, so that when the pipe actually arrived a considerable amount of the ditch was open. At the same time that the ditching and pipe-laying were being done the electric transmission line was being built. The various crews worked on different sections of the right-of-way, so that no interference would be had between them. The digging crew began work in the middle of the line and worked both ways. The construction of the electric line

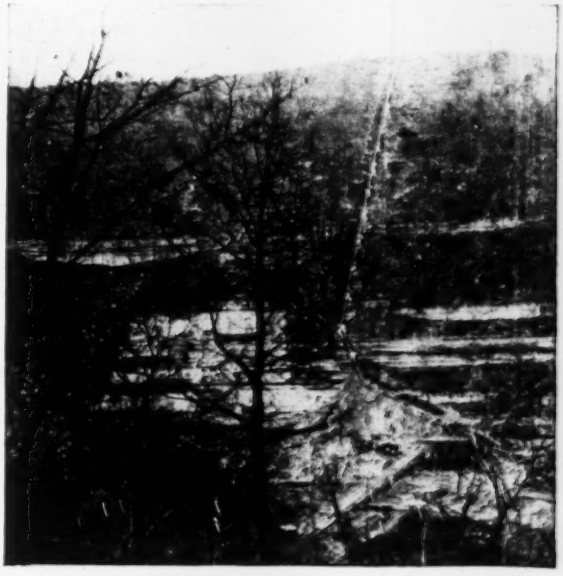


Fig. 3—At the point of intake the Kentucky River gorge is 375 ft. deep

got under way about Oct. 10 and was finally completed and the line energized by Nov. 25. This time included the building of the substations.

Each pipe-laying crew was composed of twelve men and a foreman. Each crew was furnished, in addition to the usual tools, with a wooden derrick with a chain fall for lowering the pipe into place. This method was very fast and did not necessitate the moving of any heavy crane from length to length as the pipe was laid. The greatest amount of pipe laid in any one day by both crews was 2,424 ft. and required 8¾ hours.

While the pipe and electric transmission lines were being installed the pump house and steel pipe between the pump house and the river bluff were being built.

The pumping equipment consists of one high-lift and one low-lift pump. The high-lift pump is of the two-

Fig. 4—Wooden frame and a chain-fall were used to handle the 20-in. cement-lined cast-iron pipe

stage type, having a head of 500 ft., driven by a 500-hp., 2,200-volt slip-ring motor, and operates at a speed of 1,750 r.p.m. The low-lift pump is single-stage, designed for a lift of 20 ft. and a discharge head of 40 ft. and is driven by a 2,200-volt induction motor.

The housing for the low-lift pumps is a car on wheels on a track of standard gage and is moved up and down the track as is required by a winch and cable. Two men can move the car. In order to provide for any contingency that might arise the suction piping is hung from a steel boom rigidly supported to the car, and can be raised or lowered by means of a cable and winch in the car itself. This necessitates flexibility in the suction piping, which is accomplished by a rubber hose especially built to stand a vacuum of 20 in. The actual travel in a vertical line is about 4 ft. The end of the suction line is of necessity very near the surface of the water, and to prevent a whirlpool forming a screen it was designed to operate in a horizontal position. This screen is 6 ft. long and 16 in. in diameter, punched with 3,100 ⅜-in. holes. The area of the holes is five times that of the 12-in. suction line. It has been found in actual practice that with the top of the screen 3 ft. under water and with 4 m.g.d. passing there is a slight whirlpool formed, but no air apparently is drawn through. Greater depths could not be obtained, as the government prohibited the suction line extending out into the river where it might interfere with shipping. If the bank were dredged to a greater depth, it would fill up on the next rise of the river, so this plan of procedure was not considered.

Between the screen and the rubber suction pipe is placed a check valve that acts as a foot valve.

For the discharge piping the same rubber pipe connection is used as for the suction. There were two reasons for making this connection flexible; first, it was thought that as the car was rather light considerable vibration might be experienced; and second, there would be quite a bend between the pump connection and the pipe line extending to the high-lift pump.

Whenever the river rises and it becomes necessary to move the car with the low-lift pumping equipment, there must be some method of shortening the line between the two pumps. This line is composed of 10-ft. lengths of 12-in. galvanized pipe with flanged connections. It rests on the ground between 4x4-in. timbers driven into the earth with a crossbar on top. The timbers have no particular function when the plant is in operation, but when the plant is out of commission and the car drawn up to its upper position they hold the pipe from being washed away by high water. All that is necessary to shorten the line is to unbolt a section or two as the case may be and reconnect the hose at the new point. The galvanized line is light and cheap and serves the purpose admirably.

Priming is accomplished by a small motor-driven pump. The pump's suction line is a garden hose with a check valve, which is lowered out of the rear window of the car into the river. The small pump can be primed with less than a bucket of water and will prime the large pump in about 6 min.

Lighting current is obtained at 110 volts from a dry transformer, transforming current from 2,200 volts. In order to facilitate work at night, a searchlight is attached to the rear of the car overlooking the river and also on the main pump house.

The high-lift pump house is supported on the river side by columns 8 ft. high, while on the other side no columns are necessary. This type of construction was used as it saved concrete and was quicker and cheaper to install. The pump foundations are entirely separate from the building foundation, and the bed of the pump is supported on steel framework.

Perhaps the most difficult part of the undertaking was transportation. Practically all materials, equipment and labor had to be brought in by barge from a point several miles distant. This added considerably to the expense of all raw materials. Sand and gravel for the pump-house construction were loaded by hand into bags at the sand and gravel pit, transported by truck to the river and were then loaded on a drag and pulled up the track, which was installed at the beginning of the work to facilitate the receiving and handling of materials.

A covered trough was used to chute concrete from the top of the hill to the pump-house site. This method was not very satisfactory, as the stone all came first and the grout later, so that all mixing had to be done again by hand after the batch had finally arrived.

The steel line between the high-lift pump and the top of the river bank is a welded pipe 20 in. in diameter; the first 250 ft., or that part adjacent to the pump, is $\frac{5}{16}$ in. thick, and the remainder, 300 ft., is ¼ in. thick. The line is tar-coated both inside and out and is supported by eighteen concrete piers.

Wherever it passes through these piers fins are welded to both sides of the pipe to take the downward thrust of the weight of the pipe and the water. Near the lower section of the line there are several bends and large piers. These piers are much heavier than the others

and were designed to take not only the ordinary weight and thrust, but it was felt that considerable lateral thrust might be had at points where bends occurred. To strengthen the pipes at these points, reinforcing rods were used and the piers were doweled and toed into the rock.

The pier nearest the high-lift pump house contains a Y. One branch of this Y runs to the high-lift pump itself, and on the other branch was placed a relief valve. The function of this valve was to take care of any surges that might occur, either by the tripping off of the pump by hand or by failure of the electric current.

In actual practice it has been found that whenever the pump is stopped quickly and a surge occurs, the valve is so sensitive that it opens immediately and discharges enough water to keep the pressure approximately normal. There are apparently three main surges whenever the pump is stopped, as the valve opens three distinct times approximately to its full opening and then will spurt water once or twice thereafter. The setting of the valve is only slightly higher than the normal pressure in the line, so that the valve weeps slightly at all times. A spring check valve was inserted just ahead of the pump and closes without any appreciable noise or virbration in the pipe.

The electric line was brought down over the cliff on 50-ft. wood poles, the butts of which were set 6 ft. into the rock. It is dead-ended on a single pole near the pump house and is brought over to the roof of the house and supported there on a steel framework. It then enters the building and to the bus bars of the switchboard by the use of ordinary pot heads and conduit.

On Dec. 6 the line had been completed and the pumps installed, and they were given their first test. This test was made under conditions similar to those that would be in force when the pumps were put into actual operation, but no water was pumped over the cliff, as it was thought best to wait several days longer for the piers to harden. But a run of sufficient duration was made to make sure that the motors would not heat and that all joints were tight between the river and the high-lift pump. The water actually pumped was allowed to go overboard through the relief valve and a 6-in. blow-off, which had been placed in the discharge line for this purpose.

On Dec. 10 the whole project was put into operation and water was successfully pumped to No. 4 reservoir. This was just seventy days after the first actual work started.

The pipe line is 36,000 ft. long, and it may be interesting to note that there were only two breaks in this line. Both were caused by the construction crew placing large flat stones under the pipe for aligning purposes. The cast-iron line was tested for leaks before actual pumping started and, so far as is known, only one joint gave any trouble. On the river line—that is, the line going over the cliff from the pump house—no previous test was made, and no leaks were found when it was put into permanent operation. The Lexington Water Co. is a subsidiary of the Community Water Service Co., of New York. W. S. Cramer is resident manager. The excavation, backfilling and hauling were performed by the Louis des Cognetz & Company, of Lexington. The pipe-laying was done by Marvin R. Boyce, New York City. The Pittsburgh Des Moines Steel Co. supplied and erected the steel pipe at the river cliff. H. K. Bell, of Lexington, assisted the company in the field engineering involved on this emergency job.

Ten Billions a Year Wasted

An argument for equalizing business through public-works construction

By LEWIS L. BAXTER
Of Morgan, French & Co., Architects and Engineers, New York City

CONSTRUCTION occupies the unique position of being the only major industry in which there can be no such thing as overproduction, so long as ordinary common sense is used to avoid overbuilding in particular localities and in particular classes of work. Unlimited demand exists for public work of benefit to the country as a whole. Even in the field of private work there are herculean tasks to be performed. For example, most of our older city and suburban buildings are obsolete when judged by modern standards. Consider what this will mean when our intelligence in solving our new economic problems catches up with scientific and engineering progress!

Recently H. G. Wells said of the present unemployment crisis:

> Collective enterprise in the rebuilding of cities is the only way to fill up the gap between overproduction and limited consumption. New forms of employment must be found, and the obvious thing is to consider the immense architectural possibilities. We must accept the responsibility of rehousing all of mankind, rebuilding cities and reclaiming the roads and countrysides.

What could be more logical than to assure the smooth and even flow of industry by filling in the valleys in the curve of "consumer production" with bulges in the curve representing production of that wealth that we accumulate rather than consume? It is exactly what the industrious farmer does with his time when he builds or repairs his fences and barns between the seasons of plowing and harvesting.

Productive Capacity—A Great Asset

We have reached the point where only part of the available wealth-creating power of the country is required to produce everything required for current needs. Is the remainder, the surplus labor and brains, a liability or an asset?

It is evident that this surplus capacity, which grows year by year as our efficiency increases, may be either used or wasted. The cost of what we produce consists almost entirely of the effort expended; and as we are naturally an industrious people and actually want to exert this effort, how foolish is it to consider surplus productive capacity other than as an asset that can be capitalized to raise our average standard of living higher and higher?

In estimating the value of this asset let us note that our wealth consists mainly of natural resources, improvements representing the savings from past efforts, and the productive capacity of our population.

Consider this third item: If 40,000,000 workers are capable of creating wealth at an average rate of $1,500 each per annum, this productive ability is potentially worth 60 billion dollars per year. This is six per cent on *a capital value of 1,000 billion dollars.*

Why do we allow any part of this enormous capital asset to remain non-productive? When seven million workers remain idle after all of the ordinary require-

ments of industry are fulfilled, would it not be infinitely better business to store up in the form of public improvements the wealth that this human capital is capable of producing, rather than waste it in idleness?

Ten Billions Per Year Wasted

This waste of potential wealth is going on right now at the rate of over ten billion dollars per annum. This represents interest at 6 per cent on a potential capital asset of $175,000,000,000, which for the time being remains non-productive. In comparison, the idle money in the country is an insignificant sum.

Why do we throw away all of this potential wealth from which we could receive full benefit if we would only convert our surplus productive capacity into improvements that all might use and enjoy, such as more and better highways and more modern and convenient dwellings? Partly through stupidity we are inclined to lose sight of the values that could be created and see only the wages that must be paid if the productive capacity is utilized. Five or ten billion dollars might have been required to meet this construction wage payroll this year; but in saving this amount the taxpayers collectively have lost 50 to 100 billion dollars in the depreciated values of their capital assets as earning power declined with the falling off in the purchasing power of the population as a whole.

Yet the fallacy persists unduly in banking, politics and industry. Heads of large corporations resist the idea of any substantial increase in taxes, while earnings and the market value of their stock fall to a fraction of the normal value, and even greatly reduced taxes become increasingly harder to pay.

Cost Paid With Labor

Confusing what is merely an expenditure of effort with private or corporate capital disbursements, many are inclined to interpose the objections: Can we afford to spend so much for public works? Where is the money coming from? Who is going to pay the bill? Strange as it may seem, there really isn't any bill so far as the country as a whole is concerned, and there isn't any cost attached to public improvements that is not paid in full with the labor expended at the time, even if taxes must be levied to finance them. And there isn't any mortgage against them to be paid in the future so far as the country as a whole is concerned, even if the bonds mature 50 or 100 years hence, so long as we borrow within the confines of our own country. This is the paradox that every individual in the entire construction industry should thoroughly understand, in order to help to promote not only his own interest but the interests of society as a whole.

Adoption of the national policy of public construction work in inverse ratio to private industrial activity, with the result of assured continuous employment for everybody, primarily concerns the construction industry. But its effect would be to equalize all industry, to maintain a permanent balance between production and consumption and to make depressions virtually an impossibility, at least in any country capable of producing mainly what it consumes.

However, this equalization of industry as a whole by the construction industry is not automatic and will not become an actuality unless we deliberately and understandingly set out to create it. And "we" means society as a whole, or the entire population of the country. Our national government is organized society, and until we begin to think of the government as ourselves, and not as something detached from ourselves, and government activities as the joint activities of the whole people, little progress will be made.

Nor should this equalizing process be anything violent or drastic, which would tend to make the construction industry itself unstable. Unquestionably heroic measures would be required to correct the tremendous derangement of the past two years quickly; but to maintain the balance, once it was established, would be like the gentle touches one gives to the steering-wheel of an automobile to keep it in the road, as compared with the violent pull that is required to get it back out of the ditch. It would not be necessary to have plans for vast undertakings completed far ahead and filed away, but merely to accelerate and retard the rate of progress on the normal volume of construction that absorbs the surplus labor not required for consumer production.

As to Taxes

Of course it would mean higher taxes; bond issues are merely deferred taxes, as in the long run we borrow from ourselves and pay ourselves back. But we should not confuse the taxes levied to pay for public improvements with the taxes levied to pay the overhead expenses of conducting the government. Construction taxes represent a case of pooling funds for investment, just as stockholders pool part of their wealth to furnish their corporations with funds on which they expect to receive dividends. The dividends on the investments made in public improvements consist primarily of the benefits we derive from them, but even more important is the secondary benefit to be derived if we proceed with them in sufficient volume to balance productive power and purchasing power to maintain the earning power of the producing units.

The important point is that variations in the abstract amount of the tax one pays are not so important as the wider variations in the ability to pay them. When an engineer cannot provide irrigation by gravity, the water must be pumped. It is just as essential for liquid capital to circulate through the arteries of industry. When for any reason it doesn't flow of its own accord, levying taxes and paying them out of wages amounts to exactly this pumping process. And the money merely circulates from us as taxes, to industry as wages, and back to us when the wages are spent for the things we have to sell.

This free exchange of what we have to sell for what others have to sell is essential if business activity is to proceed at a fairly constant rate. *Many have nothing to sell but labor or brains.* If we do not buy their wares, they connot buy the things we would like to sell them. The only way the community can buy this available labor, after individual requirements have been met, is to convert it into things that all can use and enjoy in common. And if we refuse to buy it at all, we lose so much of our market for what we have to sell that the falling off in our profits is more than we thought we could save by not buying it.

This is the lesson that all have learned during the last two years. It is a lesson that the entire construction industry should engage in teaching upon every opportunity. The construction industry is the logical equalizer, because it produces values that are retained and not consumed and is therefore capable of producing indefinitely without danger of creating valueless surpluses.

History and Development of the Submarine Rock Drill

Progress of underwater drilling machine different than that of land drill—Piston type still popular for shallow work—Submerged hammer type for deep operations is latest development

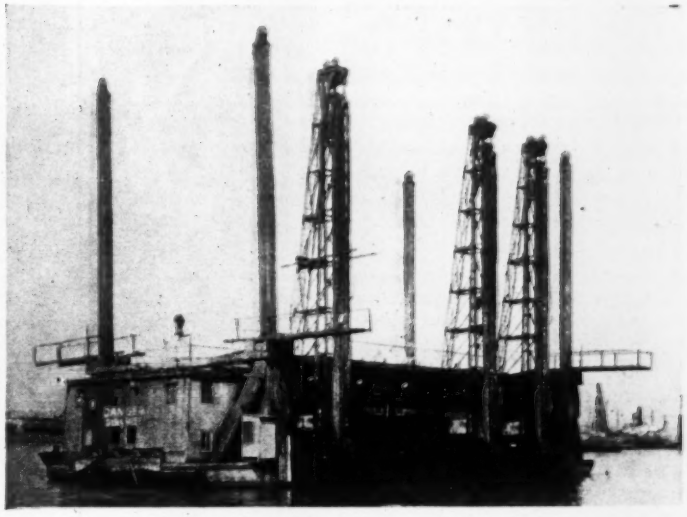


Fig. 1—Piercing the bottom of the sea

A modern drill boat, *"East River,"* of the Arundel Corp., drilling a 42-ft. channel in 36 ft. of water, New York harbor.

By CHARLES C. HANSEN
Engineer, Ingersoll-Rand Co., Phillipsburg, N. J.

IN THE EARLY DAYS of submarine rock drilling the machines followed the gradual development of the old piston drill in use at that time on land. As the early channel depth requirements were but 6 to 9 ft., a tripod-mounted land drill (Fig. 4) on a raft or platform built on the side of a scow served very well. The drill steel worked through holes or slots in the raft or platform, the drills being fed by the regular hand cranks and screw feed. As the demand grew for deeper channels, requiring correspondingly deeper drilling, these crude arrangements became inadequate. Special drills for submarine work were developed along lines somewhat different from the trend of land drills. Until recently the submarine drill was almost exclusively a piston drill, and even today is used extensively for shallow work. This is in marked contrast to the development of the land drill, which is entirely a hammer-type machine today. Hammer drills, designed especially for working submerged, are the modern answer to the demand for a submarine drill.

Early Types

Two early distinct types of piston drills competing for the drill business were the tappet-valve and the steam-thrown-valve design. In the tappet valve construction the piston struck the valve or tappet at each stroke with a cam action, thereby reversing the port opening to the piston (Fig. 2). This construction had the inherent characteristic of running with nearly a full-length stroke. When built in large sizes the valve mechanism, which consisted of a D-valve moved by the tappet, was quite heavy. With the rapid action of the piston (from 500 to 1,000 blows per minute) this construction was hard to hold together. The other type called the "Eclipse," with a steam-thrown valve, did not depend on any part of valve motion striking the piston. When the hollowed-out center portion of the piston, open to exhaust, uncovered a port leading to the end of the valve, the steam pressure on this side was reduced, the pressure on the other side then shifting the valve over. The valve was an unbalanced D-spool type, depending on unbalanced pressure to hold it in place between moves. The construction gave considerable leeway on the length of stroke of the piston, and by feeding the steel closer to the rock a lighter blow could be struck. In both types of drill the steel was clamped in the piston by a U-bolt and a chuck key that bore against the drill-steel shank.

Because of its advantages the Eclipse steam-thrown valve motion gradually replaced all other types of piston drills for submarine drilling. It has come down to the present day with only minor refinements in construction, except in size and power of the drill necessary to handle longer steel.

Early contracts—From 1878 to 1888 the drills were designed with 5-in. bore cylinders. At this time the ship channels in New York harbor, Boston harbor and the Delaware River, were for the most part 20 ft. deep at low tide. On the Atlantic seaboard, from Maine to Florida, in these ten years, 43 contracts were let by the U. S. engineers, totaling less than 50,000 cu.yd. of rock. Some of the contracts were as small as 50 cu.yd. The depth of channel varied from 12 to 22 ft. deep. In the same period on the Great Lakes twelve contracts for about 130,000 cu.yd. of rock were let, mostly for 20-ft. channels. The channel in the Hudson River to Albany was at this time 12 ft., and the Ohio River channel at Grand Chain and the Rock Island Rapids channel on the Mississippi River were both 6 ft.

During this decade, especially on the Great Lakes, the tripod mounting was found to be too slow. In this type of mounting the drill steel had to be changed every 2 ft. of depth, though in soft rock a steel could cut many times this length before requiring resharpening. The first improvement was to mount the drill on a pipe or cross-bar fastened to a sliding frame which was handled in a timber derrick. The drills retained the

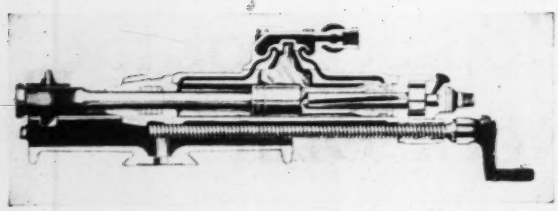


Fig. 2—An old-timer—the tappet piston drill of the early 70's

A D-valve was moved by the piston striking the tappet

feed screw and hand-cranking, the operator standing on a platform built out from the sliding frame. When the length of feed was run out in the shell, the drill was cranked back, the sliding frame lowered, usually by means of a chain block, and drilling continued. The derrick was moved along a rail runway on one side of the boat, enabling a row of holes to be drilled and loaded. The boat moved away on the spring lines when a charge was fired.

Considerable experimenting with mounting and feeding the drills was carried out during the period from 1888 to 1900. The chief improvement was the installation of a hydraulic cylinder to the sliding frame, which could be lifted the full height of the derrick and controlled from the derrick plateform. As the length of feed depended on the height of the derrick and the construction of the sliding frame, the adoption of the hydraulic cylinder was such a marked improvement that by 1900 most of the submarine drill plants were using it. In this installation the drill was bolted to the sliding frame, the drills being so constructed that the cylinders alone could be bolted directly to the sliding frame without the shell and feed screw formerly assembled with the cylinder.

From 1903 to 1905 the size of the drills was increased from a 5- to 5½- and 6½-in. bore, built exclusively for bolting to the sliding frame. The Eclipse steam-thrown valve motion, with certain refinements, continued to give the best results. Consequently, the submarine drill has come down to the present date retaining much of the original construction of the early piston drill. Steam was retained as the drilling power, and all developments were in the direction of an efficient steam drill. Beside furnishing steam for the drills, the boat's boiler plant furnishes power for the many machines that were gradually added to raise efficiency of the submarine drill plant; equipment that has reduced the cost and time of handling the drills and the boat.

When the heavy rock work on Livingston channel in the Detroit River was contracted for in 1908 to 1910, as well as similar work on St. Mary's River, Mich., and deepening of all harbors was affected by the requirements for a 23-ft. channel, a great many drill boats were built for this work, or had already been built in anticipation of the work ahead. Some of the newer plants, with five drills working over one side of the boat, worked alongside of the older boats that had been in commission for ten or more years.

By 1910 shipping interests demanded that the 36-ft. channels on the Atlantic seaboard be increased to 42 ft. at low tide. In this deepening work the submarine drill used was the same type as on the Great Lakes, and also the general design of the drill boat was maintained, with the drill mounted over one side of the boat. In general, the drill plant was the same, but longer steels were used to take care of the additional depth of water. A tidal range of 5 to 7 ft. presented some additional difficulties.

The Great Lakes construction of drill boats was also used on the Pacific side of the Panama Canal, where a tidal range of 24 ft. prevailed. In deep-water work some experimenting was done with a long screw feed and shell mounted on a drill spud. The screw feed was operated by a small reversible steam engine, but this type of feed was not generally adopted. The main objections to it came from the drill crew, for an operator was required to work on top of the spud with the drill, an undesirable location.

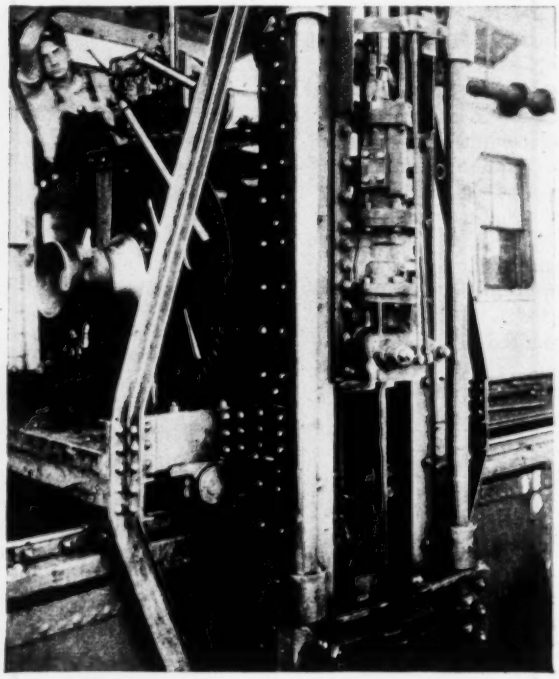


Fig. 3—A modern hammer drill on a U. S. engineer drill boat

Drill is bolted to lower end of a sliding ladder. The bottom casting carries a sand pipe and funnel on telescoping leads, for casing off the overburden.

Hammer Drills—With the adoption of the hammer drill for land drilling, where it practically replaced the piston drill, it was natural to try the hammer type for submarine drilling. For shallow water the larger jackhammers have done good work, with the operator standing on a float or small barge. The larger drifters, mounted in guides, have also been used in this manner for shallow drilling. Occasionally a diver has used a jackhammer under water, but the cost is too great for general use.

The long steels are the most serious objection for all submarine drilling, both with the piston drills and with the hammer drills. For a 42-ft. channel on the Atlantic seaboard, with a tide of 5 to 7 ft., a drill steel 60 ft. long is required. A piston drill steel this long, usually a 2¼-in. solid round bar with the bit forged on one end, will weigh about 800 lb. Naturally it is extremely hard to handle in and out of the drill.

Submerged Hammer Drills

To eliminate the long steel, the latest hammer drill designed for submarine drilling uses a steel only long enough to drill the required depth in rock. The drill

consists of a cylinder, chuck housing and an air bell that prevents the water from entering the drill. This assembly is bolted to the lower end of the structural-steel frame or ladder, which slides up and down in a derrick. The rotation motor is a separate unit located on top of the ladder, and it is never submerged. Rotation is transmitted between the motor and the drill by hollow shafts made up in 10-ft. lengths with screw couplings, driving a pinion engaging a spur gear that surrounds the chuck. The rotating shaft bearings are bolted to the cross-pieces of the ladder. The air and water pipes feeding the drill are also fastened to the ladder and are connected to the air and water supply by hose and couplings long enough to take care of the travel of the ladder. Fig. 5 shows the details of the drill assembly.

The hammer drill piston, running free and striking only the end of the steel, will start and run according to the amount of air controlled by the operator on the derrick platform. As the drill exhausts into the air bell located on the extreme lower end, escaping over the edge of the air bell into the water, it is always working against a back pressure, which varies with the depth of water. In the air bell there is also a pair of gates, or safety catches, for the steel in case it should come out of the chuck. These safety catches are operated by a wire rope extending along the ladder, and are so arranged that in case a steel should become stuck and could not be pulled it can be released from the drill and recovered after the rock is blasted. The rotating air motor on top of the ladder is controlled by a separate valve, the speed of rotation of the visible portion of the shaft serving as an indicator to the operator for the proper feeding of the drill and ladder. Without this indication to tell the condition of the rock in the hole or obstruction encountered it would be impossible to drill with a hammer drill submerged under water. The ladder and drill are handled with a small air hoist and wire rope over sheaves on top of the derrick. Control levers for the hoist and all valves for the drill, rotating motor and water, are located on the derrick platform and are handled by one operator.

Fig. 4—The original submarine drill

Large piston drills mounted on tripods were used for both land and under-water drilling from the early 70's to the late 80's.

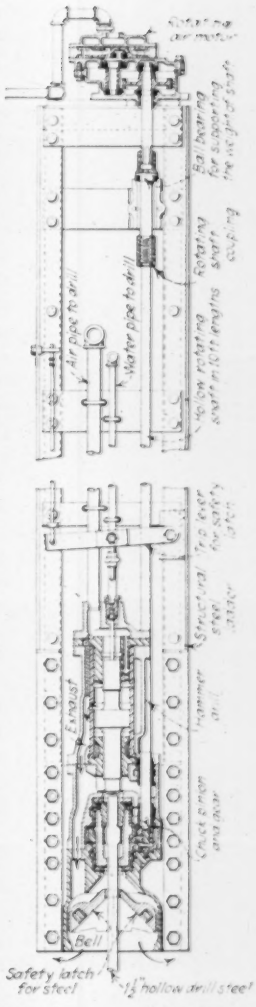


Fig. 5—Section of modern submarine hammer drill designed for working under water, bolted to the lower end of a steel ladder

Rotating motor is on top of the ladder and is never submerged. Exhaust from drill passes through bell at bottom, providing an air seal that keeps water out of drill mechanism. Ladder slides vertically in derrick leads or on a spud.

Speed—The latest hammer drill will cut the rock about four times as fast as the 5½-in.-diameter piston drill. But as actual drilling time is less than half the total time required for drilling operations, this gain in time is not fully obtained. Much time is required in warping the boat into position by the various spring lines, lifting and lowering anchor spuds, loading holes, moving drill frames to new hole locations and blasting. Drilling time has been speeded up by improvements in drill steel itself and by the simplification of handling and sharpening operations. Steel for the hammer drill is seldom required to be more than 24 ft. long, and as it is usually 1½ in. in diameter, with a ½-in. hole, the weight of a single length of steel rarely exceeds 120 lb.

Work in channels that are deeper than 42 ft. and in places where the tide is excessive is beyond the depth limit of the present piston drill. With the modern hammer drill, increased depths require only lengthening the ladder and working against a higher back pressure on the exhaust side of the drill. This is a condition that can be easily overcome by raising the air pressure.

The Future

At the present time the old piston drill submarine plant and the latest hammer drill plant are working side by side. Future developments point to the continued use of the hammer drill. While the efficiency of the piston drill might possibly be increased by using hollow steel for carrying water under pressure for expelling the cuttings from the hole, it is doubtful whether this type of drill will ever be successfully developed for deep drilling.

How Aerial Photographic Mapping Is Affected by Weather

Conditions for best work and influence of departures therefrom—Other factors of quality and speed

By E. H. CORLETT
Engineering Manager, Fairchild Aerial Surveys, Inc., New York City

MOST favorable atmospheric conditions for aerial photographic mapping usually occur during the entrance of an atmospheric high-pressure area. High-pressure areas and low-pressure areas, called highs and lows, usually follow each other eastward across the United States but, in the main, are unpredictable save within broad limits. When a high enters, the wind is usually from the northwest quadrant and is comparatively brisk; the air itself is clear and crisp. The wind may have gale velocity on the ground; when it does, its velocity at altitudes of from 10,000 to 15,000 ft. may be such that the best photographic airplanes can make little if any headway against or across it.

East of Colorado and from latitude 36° northward photographic days occur more frequently during May and early June and during latter September and all of October than in any other parts of the year. This probability should be kept in mind and map requirements anticipated accordingly, so as to insure obtaining the best map product at least expense. Lower costs also follow, since, in a period when photographic days occur frequently, the contractor need not set up as large an allowance for tie-up of airplane and crew; furthermore, work can be done more expeditiously.

The excellence of the photographs is primarily fixed by the amount of useful light—reflections from ground objects—which the photographer has available for his determination of exposure, diaphragm opening and filter. For the best work the following conditions should obtain:

1. Time 10 a.m. to 2 p.m., local sun time, succeeding and continuing an early morning period of conditions 2, 3 and 4 below.

2. No clouds at all or else very thin clouds over 15,000 ft., known as high overcast.

3. Negligible ground haze. Objects in all directions should be sharp and clear at a distance of 2 miles; the sky should be clear blue, not at all milky; shadows should be sharp-edged and sunlit objects brilliant.

4. Negligible industrial haze. Ground haze, being water particles, can be "cut" by use of filters, but smoke and dust, being solid particles, cannot. On any but very small areas an industrial haze cannot be controlled; its effect can be minimized by working on Sundays, holidays and on days when wind blows it away from the area to be mapped.

Influence of Unfavorable Conditions—The effects on photography when conditions are not ideal are, in order as listed above:

1. Diminished illumination begins to be noticeable when more than two hours away from local noon, and shadows are longer. Aerial negatives are thinner. Within limits this can be sufficiently compensated for by choice of emulsion and chemicals to give a thoroughly usable product; but, as everyone knows, the best photographs result from correctly exposed negatives.

2. While ground covered by cloud shadows can be studied photographically, interpretation is not so readily accomplished; besides, the map is not pleasing in appearance, being spotty. The comment in 1 above concerning thin negatives applies with equal force to conditions of heavy high overcast. However, especially in the summer when light is at its best, a fairly heavy high overcast is an advantage in photographing steep valleys, city streets and the like, where dense shadows would otherwise occur.

3. The heavier the ground haze the smaller the amount of effective light that can reach the sensitive emulsion of the film. Quite a bit of light of shorter wave lengths—toward the blue end of the spectrum—is reflected not from ground objects but from the haze particles and therefore not only serves no useful purpose but must be prevented, by orange filters, from reaching the film. This may result in under-exposure and, under bad haze conditions, in flat, dull, mushy photographs.

4. The effect of smoke and dust is roughly similar to that of unfiltered haze; when either is very dense, ground detail is altogether lost. Single smoke streamers are not so bad, for they obscure different areas in different exposures, and all of the ground can therefore be studied on one photograph or another.

Contract Conditions—Stated baldly on paper, the obstacles to good aerial photographic work may appear to be discouraging. However, with modern technique thoroughly usable photographs can be made under very discouraging conditions. Contracts entered into late in the fall or late in the spring, specifying neither leaves on trees nor snow on the ground, are particularly trying because of the weather hazard. Photographs required to be made under special conditions, such as low or high tide, are very troublesome in that clear weather and certain specified events must occur simultaneously. All the contractor can do is use his best judgment in obtaining a sufficient number of satisfactory negatives.

Another related matter sometimes causes strained relations between the contracting parties. It is possible for the contractor to take advantage of every small interval—an hour or less—of perfect photographic conditions by having his crew and equipment over the area to be mapped every day between proper hours. This would undoubtedly speed production of aerial negatives. But airplane operation is expensive, and the cost of the work would be very much greater if such efforts were consistently made the routine of all projects. In this respect aerial mapping, like other practical engineering, must maintain itself at the point of justifiable compromise between possibilities and practicalities—that is, where the cost-to-produce curve crosses the value-to-user curve.

Geodetic Survey Seeks Reports on Markers

Engineers can render valuable assistance to the U. S. Coast and Geodetic Survey, according to R. L. Faris, assistant director, by reporting to its headquarters in Washington the location of any of the bronze benchmarks and station marks now scattered over the country that may be discovered. The location of all these points are registered at headquarters, but considerably difficulty is often experienced with their recovery due to changes in surrounding landmarks used as witness points in the original survey. The discovery of such a mark by any person gives the federal officials an opportunity to revise its records and thus decrease the number of lost markers.

Milwaukee Expands Day-Labor Forces to Relieve Unemployment

Civic improvements created by emergency labor—Employment benefits widely distributed by short-term appointments

DURING THE WINTER of 1930-1931 more than 7,000 men, otherwise unemployed, were given work by the city of Milwaukee on public improvement projects, and a similar undertaking is to be carried on during the coming winter months. The work done by the emergency labor included extensions of the underground fire-and-police-alarm system and street-lighting system, general cleaning up and grading in the parks and grading of new playgrounds. Additional ash collection and street-cleaning service gave further employment. With the exception of those men engaged in extending the fire-and-police-alarm system, all new employees were engaged by the city civil service department. All were paid at the regular day-labor rates in Milwaukee, 60 to 75c. per hour. A total of $571,000 was spent for this purpose, of which $471,000 was for labor. The money was raised chiefly by diversion of funds within the city budget, aided to a small extent by charitable contributions.

Unemployment did not assume serious proportions in Milwaukee as early as it did in some other industrial centers. The federal census of April 1, 1930, reported 15,916 unemployed, in substantial agreement with an estimate made by the public employment office. As the year went on, however, the number of unemployed steadily increased, and on Nov. 1 the employment office estimated the total at 35,000 at least. During the approaching winter it is estimated by city officials that the total will reach 50,000. As an indication of the present acute conditions, it has been reported that private industrial activities have been curtailed to the point where weekly payrolls of Milwaukee factories are $1,000,000 less than they were during the corresponding period of 1929.

To afford some measure of relief, the city council decided in the fall of 1930 to employ as many men as possible on day-labor work for the city. A council committee on unemployment was formed, and the various city departments were canvassed for work programs that would involve a maximum of direct labor and a minimum of equipment and materials. The sum of $350,000 was diverted from the city's taxation readjustment and delinquent tax funds and was placed at the council's disposal for unemployment relief. By "taxation readjustment" is meant the amount levied annually for the purpose of placing the city's finances ultimately on a cash basis. In order to hasten this readjustment, the tax had been doubled in 1928, and in 1930 the amount collected was $508,000. Half of that sum was diverted to unemployment relief. Additional amounts were raised from bond issues, by the transfer of surpluses, by appropriations from the common council contingent fund and by the receipts of a charity football game.

Preparatory to engaging the new day-labor employees, the civil service commission proceeded with a new

Emergency Work Application

CITY OF MILWAUKEE

WRITE WITH INK

NEW WARD.....

PRINT YOUR NAME ..... (Last) ..... (First)

STREET ADDRESS .....

How long have you lived in the City of Milwaukee?.....

Where were you born?.....

Are you married?..... Age.....

What persons do you support:

Name	Age	How Related?
		Wife

Which of the above persons are working? ..... Wage .....

What is your regular trade or business?.....

How many months have you been out of work?.....

Where have you worked since January 1, 1931?

Employer	Wage	Months

How much money have you earned since January 1, 1931?.....

What other income do you have besides wages?.....

Do you own your own home?.....

How much are you paying on your home? $..... per month

How much rent do you receive?.....

What debts do you owe, and how much?.....

What agencies have you had food, fuel, rent or other relief from?

Name	How Many Times

What special needs besides supporting your family have you for work?.....

Have you ever worked for the City or County of Milwaukee?

Department	When	How Many Days

SIGN YOUR NAME..... (First) ..... (Last)

Notarial Affidavit: .....

Rejected for emergency work.....

Reason for rejection.....

Accepted for emergency work .....

Remarks: .....

Special civil-service application form for emergency work in Milwaukee

This form is prepared in duplicate.

registration for laborers' positions. A special emergency application blank was devised to allow the registrant to answer questions relating to his family responsibilities, earnings, home ownership, charitable relief already received and his need for work. As applications were accepted they were divided into three classes according to family responsibilities, those having more than one dependent, those having only one dependent and those having no dependents. Following registration, the applicants were given a physical examination by the commission's medical examiner. Medical standards were somewhat relaxed so as to admit all needy men who were not likely to become a financial risk to the city when used upon temporary work.

Emergency day-labor employees put new playground sites into condition

Upper view—start of work. Center—cutting high ground down to established grade. Lower view—grading nearly completed.

The reports of the various city departments to the council unemployment committee contained detailed plans of the work they had available, including for each project an estimate of the total cost and the direct labor cost. As the proposals were approved and funds appropriated, the civil service commission assigned the requisite number of men to the job. Under the plan in operation last year the appointments were for ten days each, at the end of which the workmen were laid off and a new group appointed. During the coming winter this plan will be modified so as to make the appointment good for fifteen days, a regular payroll interval, to facilitate the accounting. The regular wage scale in force in Milwaukee day-labor construction work was used. This was 75c. per hour for fire and police-alarm trench work, 60c. per hour for park and playground work, 65c. per hour for street sanitation and ash collection, and 70c. per hour for underground cable installation for the street-lighting system.

Preference in appointments was given to that class of applicants having the highest degree of family responsibility. In an effort to distribute the employment benefits uniformly over the city during the early months, appointments were divided equally among the 25 wards of the city. Because of the uneven distribution of distress, however, a modification of this plan became necessary to care for those districts having a large number of applicants. The total registration at the civil service commission's office at the city hall was 11,021. The number of men receiving work was about 7,000.

Early in September the possibility of extending the underground conduit system for the fire and police-alarm cables was presented to the finance committee of the council. The desirability of the improvement had been admitted for many years; but as the amount of money appropriated each year had been comparatively small, there was much work yet to do. After some study a preliminary appropiation of $10,000 was made from the common council contingent fund for the work. During November and December additional appropriations were made totaling $55,000. The bureau having jurisdiction over the alarm system has complete control of staff employment, and the new employees for the extension work were hired directly. At first the practice of the bureau was merely to continue in employment its regular labor staff instead of laying them off for the winter as had been customary and later to distribute the benefits as widely as possible; but this policy was modified to one of rotating employment, in keeping with the employment plans developed by the civil service commission for the emergency labor.

In 1928 the city had started on a twelve-year program of playground construction. At the end of the period there are to be 96 playgrounds distributed over the city's area, while there were only 23 when the program was inaugurated. Between Jan. 16 and May 10, $74,000 was spent in furthering this program with emergency labor. Most of the labor involved was for bringing to the established grade the undeveloped parcels of land purchased for future playground use. In some cases the sites had formerly been occupied by buildings, and the debris and foundation walls left after razing had to be cleared. Of the total amount spent on this work 65 per cent was represented by the wages paid to emergency labor, and 8 per cent to the department's regular employees who acted as subforemen. There were 1,724 men given emergency employment in this way.

The park department gave employoment to 2,300 men and spent $20,000. Its largest single project was the construction of a lagoon in Jackson Park, which, together with the work involved in filling adjoining marsh lands, cost $43,200. Considerable labor was also

employed in grading one section of the park's main drive, which involved the moving of 15,000 cu.yd. of earth and cost $27,000. Numerous other grading jobs were done in the parks of the city.

In extending the underground conduits for the street-lighting system the sum of $17,800 was spent and work was given to 221 men. This work consisted mainly of digging trenches in the allotted space between the curb and sidewalk and laying the conduit through which the cables would be pulled when they are required.

The largest amount of work for any department was that done for the bureau of fire and police alarm, which spent $234,000 for emergency labor. The work done in this case was similar to that involved in extending the street-lighting system.

In the twelve months beginning Sept. 1, 1930, the total amount expended was $571,000. Of this amount $62,000 was for materials and supplies, $38,000 for teaming and trucking, and $471,000 for direct labor. The regular forces of the city were not reduced in any way, and no added tax burden was imposed.

To begin the program for the coming winter, the civil service commission opened a new laborers' registration on Oct. 1. The council has appropriated $140,000 for playground grading, fire and police-alarm extension, sewer cleaning and street-lighting system extension. Men were put to work on these projects on Oct. 19.

Spokane Gives Profitable Work to Unemployed

MUNICIPAL OFFICIALS of Spokane, Wash., supported by the Chamber of Commerce and civic organizations, have determined that every able-bodied man who wants to earn his board and lodging shall have the opportunity so long as there is any necessary public work to be done. To this end the city has planned a public-works program, which, it is hoped, will permit private charities to devote themselves to the feeble, the sick and to children.

The construction program already authorized includes a sub-trunk sewer project, the grading of streets, the widening and rounding of corners and the building of retaining walls. The city planning commission has also recommended the construction of a 1,400-ft. bridge over the Spokane River and the improvement of two bypass streets. The city engineer is rushing plans for these developments, which will cost more than a million dollars. The expense will be apportioned between the city, the state and the property directly benefited.

Last winter much-needed street paving offered a practical field of work; but as the unemployment situation reached an acute stage during the winter months, no actual paving was done, the relief labor being employed with necessary excavating and preparation of subgrade. Cliff Drive, the scenic boulevard of the city, was constructed last winter by this method. The cost of this work is borne by special relief funds, and in this way the cost of the ensuing paving operations, assessed in the usual manner, fell more lightly on owners of abutting property. Further grading work of a similar nature will be done this winter so that needed paving may proceed, at reduced cost to property owners, in the spring.

Last winter 1,400 men were given employment in Spokane, a city of 116,000. Married men received two or three days' work per week at the rate of $3 per day, payable half in cash and half in scrip redeemable for necessities at local stores. Single men were given lodging, board and medical attention in return for half-days of labor. There was less panhandling on the streets of Spokane last winter than for many years. The cost, borne jointly by city and county, amounted to $76,000.

The improvement work undertaken under this plan is laid out and supervised by A. D. Butler, city engineer, and Allen R. Scott, county engineer. H. W. Arvin, county superintendent of charities, examines and passes applicants after they have registered for work at the municipal employment office.

Employment of Engineers by Government Increased

By H. M. FRIEND
Bronxville, N. Y.

EMPLOYMENT of engineers by the federal government has increased rather than decreased during the present period of depression. This conclusion is drawn from a recent survey of engineers in federal work made by American Engineering Council. At present there are about 100 bureaus carrying on work that requires the services of engineers. The accompanying table covers the 34 bureaus that are the chief employers of engineers.

It will be noted that the Corps of Engineers, U. S. Army, heads the list with 1,026 engineers. The Patent Office is second with 734, and the Bureau of Construction and Repairs, U. S. Navy, is third with 616.

The total number of engineers in these 34 bureaus has steadily increased each year since the tabulation was started in 1927. It is interesting to note that since the depression began in 1929 the federal government has not been dropping its engineers. In fact the total number in federal bureaus has increased about 33 per cent since June, 1930.

Bureaus	Total Number of Engineers, June 30				
	1927	1928	1929	1930	1931
Aeronautics branch, Dept. of Commerce	14	24	45	64	82
Agricultural engineering	53	53	59	73	80
Air corps, War Dept.	72	84	76	93	89
Chemical warfare service	9	11	17	24	22
Coast Geodetic Survey	234	245	239	273	282
Corps of Engineers, U. S. Army	507	580	756	1,010	1,026
Engraving and printing	10	10	10	11	11
Federal Power Commission	8	9	9	9	8
Federal Radio Commission	..	1	4	8	12
Foreign and domestic commerce			No record		
Geological survey	309	326	390	422	459
Indian affairs	33	41	43	38	43
Inland Waterways Corp.	4	5	6	7	9
Interoceanic Canal Commission*	...	...	...	300	300
Interstate Commerce Commission	231	238	289	430	416
Lighthouses	125	174	199	298	364
Mines, Bureau of	102	105	117	114	125
Navy, Bureau of Ordnance					
Navy, Bureau of Aeronautics	113	112	134	157	154
Navy, Bureau of Const. and Repair	576	627	630	613	616
Navy, Bureau of Engineering	83	83	85	87	90
Navy, Bureau of Navigation	30	35	37	37	41
Navy, Bureau of Yards and Docks	54	59	65	67	88
Ordnance Department	32	32	37	40	42
Patent Office	557	570	634	728	734
Public Health Service	27	26	25	25	26
Public Roads, Bureau of	409	414	436	499	523
Radio Division, Dept. of Commerce	33	44	56	78	84
Reclamation, Bureau of	136	163	183	236	267
Standards, Bureau of	115	113	128	136	134
Steamboat inspection service	125	127	128	128	150
Supervising architect's office	147	167	195	306	348
U. S. Shipping Board	59	58	53	35	25
Veterans' administration	83	83	105	124	141
Total	4,289	4,619	5,190	6,370	6,791

*Includes a battalion of regular army engineers sent to Nicaragua the latter part of 1930 and returned in July, 1931. All other assignments to this work are included in Corps of Engineer figures.

Vertical-Load Analysis of Rigid Building Frames Made Practicable

Direct solution of individual joints gives close first approximation, which quickly converges toward accurate values of joint moments

By JOHN E. GOLDBERG
Recently Fellowship Instructor in Civil Engineering, Northwestern University, Evanston, Ill.

THE DESIRABILITY of a practicable method of rigid-frame analysis is unquestioned. To emphasize the fact, it may be noted that the trend of new building codes is toward allowing, or actually demanding, the accurate calculation of moment distribution in rigid frames. A correct analysis of almost any continuous frame will show that the one-tenth and one-twelfth coefficients are far from satisfactory; they reduce the factor of safety and cause a waste of material.

Of late, many methods of analysis have been proposed. One type for example, bases its solutions upon the assumption of contraflexure at the mid-lengths of columns, and so on. Such a method is hardly more satisfactory than the old coefficients. A refinement of the method uses multitudinous graphs and constants to shift the points of inflection and points of maximum moment, but this makes the method impractical from the standpoint of everyday design.

Exact Analysis—Another form of analysis is based upon the slope-deflection theory. (In 1915 the method of slope deflection was presented by Prof. George A. Maney as a general method for the solution of rigid frames.) There are several variations, representing different ways of handling the slope-deflection equations, but all are difficult and time-consuming in practical use. However, the very fact that the slope-deflection theory forms the basis of so many of them is definite proof that the theory needs no defense.

The method herein presented is a method that has been developed and used by Prof. G. A. Maney. It is a method that adds ready practicability to a system whose theoretical value is proven. No approximate method is so easy, so direct and so sure of final accuracy as this simplified solution based upon the correct slope-deflection equations.

Fundamental Equation

The fundamental equation of the method is the general slope-deflection equation for the end moment of any member whose ends have been subjected to rotation. Referring to Fig. 1, it is:

$$M_{AB} = M_{F\text{-}AB} - 2(EI/L)(2S_A + S_B) \qquad (1)$$

where M_{AB} is the actual moment at the end A of member AB, $M_{F\text{-}AB}$ is the *fixed-beam moment* at the end A of the member AB.

In the case of beams carrying no load, columns, and frames under purely lateral loading such as wind, this term disappears. In the case of loaded beams certain well-known values of this moment are: (a) for uniform loading, $wL^2/12$; (b) for concentrated load at mid-span, $PL/8$; (c) for third-point loading, $2PL/9$.

E is the modulus of elasticity of the member.

I is the moment of inertia of the cross-section of the member.

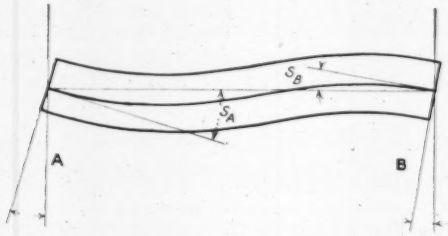


Fig. 1—Basic distortion diagram of frame member for establishing moment formula

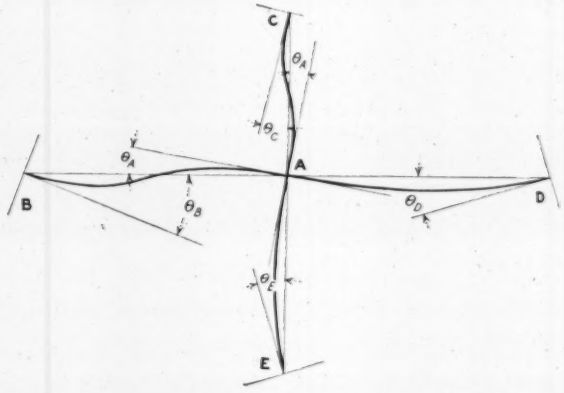


Fig. 2—Element of the frame, formed by two columns and two beams meeting at a joint

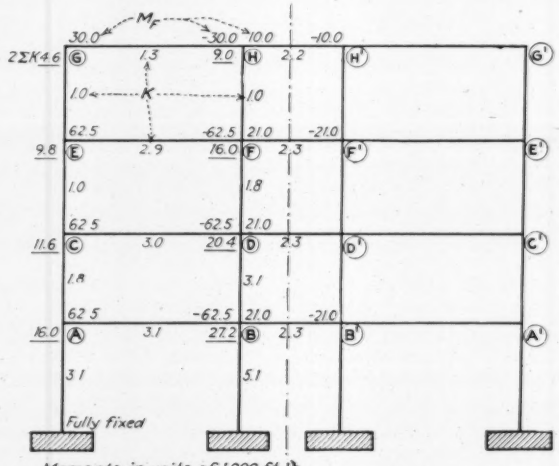


Fig. 3—Data for exact moment computation by approximation

Values of $2\Sigma K$ are underlined. Fixed-end moments are written without underlining.

L is the length of the member (usually specified as the clear length).

S_A and S_B are the angular rotations at the ends A and B, respectively, in radians, whether caused by loading of the member or by external forces and moments. Clockwise moments as well as clockwise rotations are assumed to be positive, while counter-clockwise actions are assumed to be negative.

For greater convenience the fundamental equation is thus rewritten:

$$M_{AB} = M_{F\text{-}AB} - K_{AB}\,(2\theta_A + \theta_B) \qquad (2)$$

The term K_{AB} is an abstract number expressing the ratio of $2EI/L$ for the member AB to a similar quantity for some standard member of the frame. Usually it is best to take as standard member that member which has lowest value of $2EI/L$, or when all members are of the same materials the lowest value of I/L, since E in numerator and denominator cancels. Since the product of $K\theta$ must equal the product of $(2EI/L)S$, the actual rotation of a joint in radians will be, if all other quantities are in units of pounds and inches or pounds and feet:

$$S_X = \theta_X \frac{K}{2EI/L}$$

Joint Equilibrium—At any joint $\Sigma M = 0$, since the joint is in equilibrium (Fig. 2). Therefore we may write:

$$\begin{aligned} M_{AB} &= M_{F\text{-}AB} - K_{AB}(2\theta_A + \theta_B) \\ M_{AC} &= M_{F\text{-}AC} - K_{AC}(2\theta_A + \theta_C) \\ M_{AD} &= M_{F\text{-}AD} - K_{AD}(2\theta_A + \theta_D) \\ M_{AE} &= M_{F\text{-}AE} - K_{AE}(2\theta_A + \theta_E) \\ \hline \Sigma M &= \Sigma M_F - 2(\Sigma K)\theta_A - \Sigma(K\theta_X) = 0 \end{aligned}$$

This may be written in the form:

$$\Sigma M_F = 2(\Sigma K)\theta_A + \Sigma(K\theta_X) \qquad (3)$$

Equations of this form, for every joint of a rigid frame, would be the slope-deflection equations for that frame under the assumed loading. Simultaneous solution of these equations would yield values for the θ's, which in turn would be substituted in appropriate equations of type (2) to obtain the final moments. This was the form of procedure of the original slope-deflection method.

However, a still more convenient method may be derived by solving equation (3) for the value of θ_A:

$$\theta_A = \frac{\Sigma M_F - \Sigma(K\theta_X)}{2(\Sigma K)} \qquad (4)$$

In this equation the only unknowns are the θ_X's. It is therefore obvious that if we could obtain a reasonable approximation for each of these θ_X's, we could compute a fairly close approximation to the value of θ_A. Further, the value of any θ may be considerably in error without greatly affecting the actual computed moments that are our goal.

The method can best be explained by an illustrative solution, that of the frame shown in Fig. 3. Since the frame and its loadings are symmetrical about the center line, we need deal with only half of the structure.

First Approximation—It is evident that the value of any θ should be in the neighborhood of $\Sigma M_F/2(\Sigma K)$ for its joint, since (see Equation 4) the true value of θ is equal to this fraction modified by positive or negative corrections, which take into account the effect of adjacent joints. Applying this relation to *alternate* joints we obtain a set of first approximations for the rotations of these joints (a study of Fig. 3 will show the origin of each quantity):

$$\theta_A = \frac{62.5 - 3.1\left(\frac{-41.5}{27.2}\right) - 1.8\left(\frac{62.5}{11.6}\right)}{16.0} = 3.59$$

$$\theta_D = \frac{\begin{array}{l}-41.5 - 3.1\left(\frac{-41.5}{27.2}\right) - 3.0\left(\frac{62.5}{11.6}\right) \\ \quad - 1.8\left(\frac{-41.5}{16.0}\right) - 2.3(-\theta_D)\end{array}}{20.4} = -2.67$$

$$\theta_E = \frac{\begin{array}{l}62.5 - 1.0\left(\frac{62.5}{11.6}\right) - 2.9\left(\frac{-41.5}{16.0}\right) \\ \quad - 1.0\left(\frac{30.0}{4.6}\right)\end{array}}{9.8} = 5.93$$

$$\theta_H = \frac{\begin{array}{l}-20.0 - 1.3\left(\frac{30.0}{4.6}\right) - 1.0\left(\frac{-41.5}{16.0}\right) \\ \quad - 2.2(-\theta_H)\end{array}}{9.0} = -3.81$$

The remaining joint rotations may be obtained by substituting these values in equations of the same type:

$$\theta_B = \frac{-41.5 - 3.1(3.59) - 3.1(-2.67) - 2.3(-\theta_B)}{27.2} = -1.78$$

$$\theta_C = \frac{62.5 - 1.8(3.59) - 3.0(-2.67) - 1.0(5.93)}{11.6} = 5.01$$

$$\theta_F = \frac{-41.5 - 1.8(-2.67) - 2.9(5.93) - 1.0(-3.81) - 2.3(-\theta_F)}{16.0} = -3.65$$

$$\theta_G = \frac{30.0 - 1.0(5.93) - 1.3(-3.81)}{4.6} = 6.32$$

Progressive Correction—A second set of approximations for the first group of joints will give more than sufficient accuracy for all practical purposes, although absolute values of the rotations and moments could be obtained by several more approximations. The second approximation, carried out by using the θ values just computed, is for the first set of alternate joints:

$$\theta_A = \frac{62.5 - 1.8(5.01) - 3.1(-1.78)}{16.0} = 3.69$$

$$\theta_D = \frac{-41.5 - 3.1(-1.78) - 3.0(5.01) - 1.8(-3.65) - 2.3(-\theta_D)}{20.4} = -2.45$$

$$\theta_E = \frac{62.5 - 1.0(5.01) - 2.9(-3.65) - 1.0(6.32)}{9.8} = 6.32$$

$$\theta_H = \frac{-20.0 - 1.0(-3.65) - 1.3(6.32) - 2.2(\theta_H)}{9.0} = -3.62$$

Using the second approximations for the angles of the first group (A, D, E and H), together with the first approximations for the angles of the second group (B, C, F and G), in the standard equation (2), we may now calculate the end moments of the various members. Joints C and D furnish typical illustrations. The table below also shows the final moments that may be obtained by only three approximations, and the moments as computed by the old coefficient system.

Error of Coefficient Method—To say nothing of the column moments, it is obvious that the old coefficient system gives values that may be greatly in error and not

MOMENT CALCULATION FOR JOINTS *C* AND *D*

	Practical Moments			Final Values	Moments by Old Type Coefficients
$M_{C\text{-}A$	0	−1.8[2 (5.01) + (3.69)]	=	−24.7	−24.3	0
$M_{C\text{-}E$	0	−1.0[2 (5.01) + (6.32)]	=	−16.3	−16.1	0
$M_{C\text{-}D$	62.5	−3.0[2 (5.01) + (−2.45)]	=	39.8	40.4	75.0
	(check) $\Sigma (M) = 0$			−1.2	0.0	
$M_{D\text{-}B$	0	−3.1[2 (−2.45) + (−1.78)]	=	20.7	20.6	0
$M_{D\text{-}C$	62.5	−3.0[2 (−2.45) + (5.01)]	=	−62.8	−62.7	75.0
$M_{D\text{-}E$	0	−1.8[2 (−2.45) + (−3.65)]	=	15.4	15.4	0
$M_{D\text{-}D'$	21.0	−2.3[2 (−2.45) + (2.45)]	=	26.6	26.6	21.0
	(check) $\Sigma (M) =$			−0.1	0.0	

always on the safe side, especially in a short span located between two heavily loaded long spans. Even in a problem as general as the one above, the extent of these errors may be considerable. On the other hand, the final or exact values (as given by three approximations) show that the moments based upon 1½ approximations are always well within five per cent.

This simplified method embodies a feature or virtue not possessed by other methods. Approximate methods, in general, proceed upon various assumptions and presumptions with the result that a complete solution of possibly six or more approximations must be made before any error can be discovered, or counterbalanced. On the other hand the present method, proceeding along more natural lines, allows the various approximations more freedom; and therefore, barring errors, the sum of the moments at any joint should approach zero, this in itself being a constant check on accuracy.

The significance of the relative values of I/L for reinforced concrete is still a subject of controversy. Although L is quite generally assumed to be the clear length of the member, there is considerable variation of opinion about I, especially for beams. For rectangular columns I is usually specified as proportional to d^4, while the specification for beams is $b'd^3$. Many engineers advocate the use of $2b'd^3$ because of the additional strength of the flanges of the beams. As a matter of fact, the compressive steel in columns gives them an actual rigidity considerably more than is indicated by d^4 so that the relative values of stiffness or rigidity may fairly be based upon d^4 and $b'd^3$. In fact, there might even be considerable inaccuracy in the relative rigidities without greatly affecting the moment distribution.

Field Observations on Highway Practices

Hastened Program Provides 5,000 More Road Jobs in New York

Planning ahead in 1930 followed by early appropriations by state legislature advanced 1931 road work nearly sixty days

By C. S. HILL

Associate Editor, Engineering News-Record

EMPLOYMENT in roadbuilding in New York State has been much greater this year than ever before. About 5,000 more men are at work, 73 more contracts have been let, 207 more miles of road constructed and $10,000,000 more obligated by contract. These figures are as of Sept. 15, 1931. They are the result of a purposeful effort to make state road construction and maintenance an active agency for relieving unemployment.

In undertaking this greater highway program for unemployment relief two policies were set up as economically fundamental: (1) Orderly system development should not be departed from; and (2) actual employment should be furnished at the earliest possible date. The thought was not merely to devise something for the idle to do but to accelerate work that needed to be done. Every improvement was inaugurated because the improvement was needed, and ultimately would have been provided had there never been an unemployment emergency. An unemployment emergency was recognized, however, by both the legislature and the department, and they acted promptly to speed up normal procedure. Contracts began to be awarded two months earlier in the year than ever before, and by April 8, when the first contract for 1930 roadbuilding was awarded, contracts had been let for more than 400 miles of road at a total contract cost of nearly $17,600,000. The first bids for work were received Feb. 13, 1931.

Preparatory Procedure

Early contract letting required advanced program planning. This was begun in September, 1930. At that time there was no certainty that the 1931 budget allotment and legislative appropriations for highway work would be more than normal, but it was anticipated as probable, if not certain, that additional highway construction would be one of the means employed by state administration and legislature to meet the pressing need of employment. The division of highways, therefore, prepared itself for this contingency by adding to its normal planning program a supplemented program extensive enough to absorb any appropriation beyond normal that might reasonably be expected.

As the supplemental program might not be adopted, it had to be prepared without increasing the normal organization forces. Its planning was additional work for an organization busy in closing up the work of 1930, which was the largest in amount ever undertaken in any year prior to 1931. This necessitated additional working hours. Vacations were curtailed, the working day was lengthened, Saturday half-holidays were reduced, and occasional Sunday work was required in both field and office. The objective of the supplemental planning was not merely to have planning well advanced but to have specific plans ready for calling bids. The county authorities, who furnish all right-of-way, had to be notified and activated, checks and approvals carried

through, supplemental specifications written, and all the formalities surrounding public-work contracting satisfied. None of this work was unusual, but it had to be done in addition to completing one normal program and preparing another.

It is only a deserved tribute to engineering loyalty to state here that these extra demands on time and energy were accepted all down the line of employees without protest and without increase in pay. The possibility of accomplishing the task at all rested of course in the possession by the division of highways of an organization for carrying out a very large normal program.

To capitalize the planning done by the division of highways, prompt action was taken by the state legislature and executive. In New York no funds for highway improvement come directly to the division of highways. Its estimated requirements are written into the state budget on which the legislature passes at its will. Ordinarily the legislature acts on the budget appropriations in March (March 18 in 1930). To hasten the employment of men on road work, it acted earlier in 1931. On Jan. 22 it appropriated a part of the budget amount, leaving decision on the total for later consideration. Final action, however, was taken on Feb. 17, or nearly a month earlier than that of the previous year. With money available on Jan. 22 the division of highways on Feb. 13 opened bids for 14 miles of road costing about three-quarters of a million dollars at contract prices.

Progress of Contract Letting and Construction

The distinctive features of the road work of 1931 are the early and rapid rate of contract letting, the large number of contracts and bidders, the general underbidding of the engineers' estimates and the fast progress of construction. The contract data are given in Table I.

A total of 277 contract lettings averaging 3.46 miles of road each, was held from Feb. 13 to Sept. 15, or nearly 35 miles of road work were put under contract every eight calendar days. In addition, four other lettings were held for shops and warehouses costing (contract prices) $121,000. The first letting of 1930 road work was on April 7; on April 8, 1931, as shown on Table I, contracts had been let for 401.37 miles of road work at a contract cost of $17,597,986. These figures are not presented as records of mileage or expenditure but as indicating the success in getting road construction under way fast and early in the year, so that unemployed men could be put to work. They prove the practicability of expediting public-works contracting when a firm disposition to do so is shown by legislatures and executives.

The columns in Table I giving the number of bids, bidders and contracts, and particularly the column showing the percentages that contractor underbid the engineers' estimates, indicate the keen competition for work. This did not moderate as mileage under contract accumulated; the number of bids and the underbidding percentages were quite as large in the last groups of contracts awarded as in the groups advertised in February and March. By crowding its road improvement the state suffered no loss, but instead obtained greater values for its expenditures besides the indirect economy of better service to its road users.

Generally the contractors have not had too bad a time. They set low prices—too low for stable business—but the sharp cut in materials prices, lower wages and increased efficiency of labor have helped to offset the low bids. The state engineers have kept pressure on to insure progress, and generally the various projects will be carried through on time. As indicating the steady progress a summary by districts of work done and men employed is given in Table II. This covers operations up to as close to Sept. 1 as the records are compiled.

In interpreting this policy and the records of 1931 work the background of road history in the state has to be considered. When the automobile era brought its intensive demand for more stable road types, the state had a road system largely improved to the standards of that time. Its construction requirements have nothing of an emergency character to get travel out of the mud. Instead they have been modernizing and reconstruction tasks—line rectification, widening and building more durable surfaces. Roadbuilding in New York marks no highest mileage peaks but shows a continuous accession of considerable annual mileages, as indicated by the following tabulation:

Year	Miles	Square Yards
1925	365.61	3,850,412
1926	309.50	3,376,429
1927	387.59	4,544,389
1928	395.12	4,715,198
1929	428.92	5,323,766
1930	437.33	5,451,982
1931 to Aug. 25	603.74	7,779,755

The improvement program of 1931 represents a definite increase in activity to meet the present economic situation. It has been under the direction of the department of public works, of which Frederick Stuart Greene is superintendent and Arthur M. Brandt commissioner of highways.

TABLE I — CHARACTERISTICS OF CONTRACT BIDDING ON 1931 NEW YORK HIGHWAY WORK

Date	No. of Bidders	No. of Bids	No. of Contracts	Miles	Estimated Cost	Contract Price	Per Cent Underbid
Feb. 13	80	134	12	14.01	$977,885	$747,578	23.6
Feb. 20	98	120	12	22.12	1,328,732	1,004,916	24.4
Feb. 27	111	150	15	50.45	3,282,024	2,526,997	23.0
March 3	67	97	12	63.31	3,682,004	2,929,887	20.4
March 13	88	108	10	54.20	2,617,532	2,051,830	21.6
March 20	84	119	12	68.91	3,408,931	2,689,638	21.1
March 27	86	126	11	65.00	3,906,648	3,146,225	19.5
April 7	73	126	12	63.22	3,224,821	2,499,682	22.5
April 10	113	129	11	35.73	2,342,360	1,789,945	23.5
April 14	95	129	12	21.41	1,542,855	1,217,040	21.1
April 17	5	5	1	7.52	378,467	293,832	22.4
April 21	95	136	11	43.16	2,472,002	1,834,020	25.8
April 28	76	106	12	51.57	3,074,459	2,315,754	24.7
May 5	105	133	12	33.98	1,887,153	1,295,139	31.4
May 12	88	133	11	39.45	2,241,409	1,602,855	28.5
May 13	3	3	1		41,467	23,451	43.5
May 25	9	9	1	0.17	189,610	138,305	27.1
May 26	87	136	11	33.38	2,531,643	1,815,345	28.6
June 9	70	104	12	51.87	3,298,904	2,435,037	26.2
June 23	100	141	11	35.58	2,811,627	2,023,381	28.6
July 7	122	163	12	38.91	2,695,667	1,863,086	30.9
July 14	110	159	13	2.496	521,483	346,929	33.4
Aug. 4	133	214	13	50.79	3,669,627	2,444,062	33.4
Aug. 11	16	16	1	1.53	390,735	276,279	28.8
Sept. 2	123	182	12	30.19	2,367,917	1,671,755	29.4
Sept. 8	108	15	12	48.25	3,048,476	2,130,800	30.1
Sept. 9	6	6	1	0.4	146,814	122,649	16.5
Sept. 15	104	144	11	4.75	541,489	379,463	29.9
Totals	2,255	3,185	277	933.356	59,213,560	43,616,200	26.5

TABLE II — TYPICAL WEEK AND TOTAL TO AUG. 25 OF 1931 ROADBUILDING IN NEW YORK STATE

District No.	No. of Contracts	No. of Men Employed by Contractors	Sq. Yd. Pavement for Week	Sq. Yd. Pavement for Season	Maintenance Men	Miles for Week	Miles for Season	Percent of Entire Land Miles
1	32	1,487	89,105	1,094,318	854	6.73	85.35	14
2	32	1,753	92,091	1,065,337	736	7.35	85.93	13
3	29	1,500	87,797	798,800	513	7.48	68.09	13
4	24	1,153	44,828	620,825	662	2.98	49.35	6
5	22	1,189	66,511	712,087	381	4.66	53.52	6
6	23	928	56,500	493,538	547	4.88	43.17	8
7	31	1,469	61,471	547,535	604	5.25	47.43	8
8	47	2,610	107,748	1,126,919	918	6.76	70.14	16
9	35	1,590	84,941	677,659	613	7.30	56.34	11
10	19	667	31,603	642,737	180	1.81	44.42	7
Total	294	14,346	722,595	7,779,755	6,008	55.20	603.74	102

Sixty-Inch Cast-Iron Conduit Brings Water to Atlantic City

New line for emergency use replaces 25-year-old wood-stave pipe laid across swamp land and subjected to occasional salt-water inundation

By C. G. WIGLEY
Civil Engineer, Atlantic City, N. J.

THE PRINCIPAL FUNCTION of a new 60-in. pipe line in the collection system at Atlantic City is to furnish an adequate, quick and sure emergency supply for unusual drafts, such as large fires and occasional unusual peak loads during summer months. In consequence it was necessary that the conduit should have ample carrying capacity.

The water supply for Atlantic City is derived from sources 5 miles away located on the main land. In past years the supply was derived partly from artesian wells and partly from surface storage of the waters of Absecon Creek. At present the water supply is practically all derived from artesian wells, with the surface supply held in reserve for emergency use only. When the waterworks were orginally installed the surface waters were carried to the pumping station through an open channel 1.8 miles long. Due to the fact that salt water, at times of extreme storm tide, flooded adjacent areas and entered the channel, a wood-stave pipe line, 42 in. in diameter, was constructed in 1904. After

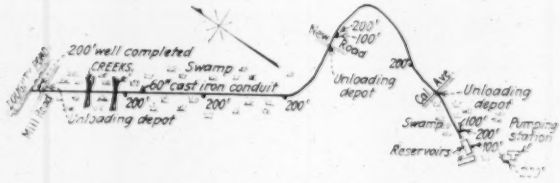


Fig. 2—Supply line and well locations, Atlantic City, N. J., water system

being in use for 25 years, this line was in such condition that it was considered unreliable, and a new line was constructed.

The new line is 9,600 ft. long and has a 4-ft. fall from inlet to outlet. The maximum head on the pipe line is 11.5 ft. from center of pipe to spillway level. The elevation of the water in the reservoir varies considerably, depending upon rainfall, seepage, evaporation and use of water, so that at times the pipe line would have only a low head available at the inlet end.

For a considerable portion of its length the pipe line passes through fresh-water swamp land. The new pipe was laid with the invert at the same elevation as the old 42-in. wood stave pipe and 10 ft. from it in order to prevent caving and breaking of the wood-stave main, which it was necessary to keep in service during construction. The bottom of the pipe was, therefore, at about mean-low tide level. The new line was laid in the old canal to reduce the excavation cost and has an average of 1 ft. of cover after backfilling the trench. A good sand and clay bottom was found in the trench. The only piling used was for crossing streams.

Along the pipe line ten 100- and 200-ft. artesian wells are located, and from them water is pumped into the conduit by motor-driven deep-well pumps. The water enters the 60-in. main through blow-in T's. These are

Fig. 1—Laying 60-in. cast-iron pipe near discharge end of new Atlantic City line

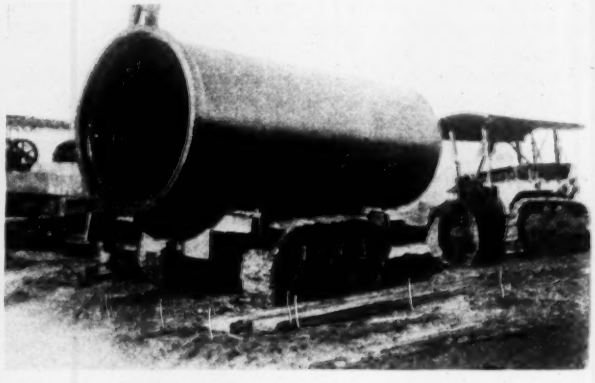


Fig. 3—Topographical conditions (view at left) made crawler equipment (right-hand view) a necessity on Atlantic City's new water-supply line

the same as blow-off T's, the bells of which are cast so that the entrance is at the top of the main.

After consideration of various materials, it was decided that a light-weight cast-iron pipe of sand-cast type and high tensile strength would be best for the purpose except where the pipe line crossed main roads. The barrel of the pipe has a thickness of metal of 1.06 in. For crossing highways class C pipe was used to take care of the future heavy traffic loads at these points.

The 60-in. pipes were unloaded from the railroad cars by a locomotive crane to auto trucks and transported about 1½ miles to three depots where highways crossed the route. From these depots the pipe was loaded from skid platforms to a crawler trailer, which was hauled by a crawler tractor along the pipe line. The longest haul on the trailer was ½ mile. Due to the soft marshy nature of the ground, a crawler excavator was used and a crawler crane for laying the pipe.

The joints were left exposed until the pipe line was filled, and all were inspected for leakage. Jute and 2½-in. of leadite was used. At stream crossings the pipe line is temporarily carried by 10-in. piling and 10x10-in. longleaf yellow pine caps. Valves are placed on each end of the pipe line, so that any repairs may be easily made. The valves used were the 48-in. square-bottom, electrically operated, horizontal type.

The new 60-in. cast-iron pipe conduit has a capacity ranging from 30 to 40 m.g.d., depending upon the head at the intake. This is double the capacity of two 42-in. cast-iron pipes. Had the latter been used, it would have required 400 tons additional weight of pipe, and 50 per cent more jute and joint material would have been required in addition to the greater cost of hauling, excavating and laying.

The cost of pipe and fittings delivered along the route was $195,443.80, and of laying, jointing, piling, etc., was $76,520.75, or a total cost per foot of $28.33.

Unit prices were as follows:

For furnishing and delivering 60-in. high tensile pipe, per foot	$19.25
60-in. class C pipe, per ton	44.40
Class B, special casting, per ton	160.00
Excavating, laying, jointing, etc., 60-in. pipe, per foot	7.80
For hauling and placing one 48-in. valve	350.00
Ten-inch piles, oak, spruce or pine, per foot	0.75
Longleaf yellow pine caps 10x10in.x5ft., each	5.25

The design and construction of the pipe line was under the supervision of Lincoln Van Gilder, chief engineer of the Atlantic City water department. L. A. Kuehnle, city commissioner, has charge of the water department. Joseph Cugliotta, Inc., Burlington, N. J., was the contractor for laying the pipe.

World's Largest Gasholder in Chicago Is of Non-Telescoping Type

Polygonal tank of 20,000,000 cu.ft. has steel piston floating on gas—Tar makes gas-tight seal—Serves as aviation marker

MATERIAL INCREASE in the size of gasholders has been made practicable by the development of the waterless non-telescoping design that was introduced into this country six or seven years ago, reducing the great weight of the ordinary type, which, with the weight of the water in the tank, made foundation conditions difficult in many cases. Thus 15,000,000 cu.ft. is considered the maximum economic size for the ordinary type, and there are a few of such size. But a gasholder of 20,000,000 cu.ft. capacity, of the new type, was designed and built for the Peoples Gas Light & Coke Co., of Chicago, in 1928. This gasholder, shown in Fig. 1, is believed to be the largest gasholder ever built. More recently the company has built two gasholders of the same type but of smaller capacity.

The tank of this holder, 280 ft. in diameter and 373 ft. high to bottom chord of roof trusses, is not cylindrical but is a 28-sided polygon, covered by a slightly domed roof on steel trusses, as shown in Fig. 2. Within it rides a structural-steel diaphragm or piston, having a rim formed as an annular trough, which is filled with tar as a seal, confining the gas to the space below the piston. Thus the piston, which weighs about 1,612 tons including the tar and 10,000 concrete blocks, floats on the gas, rising and falling as the content of the tank varies.

The total weight is about 5,500 tons, most of which is represented by the steel shell. The steel tank bottom rests on a concrete mat varying in thickness from 18 in. at the edge to 6 in. at the center. This mat is

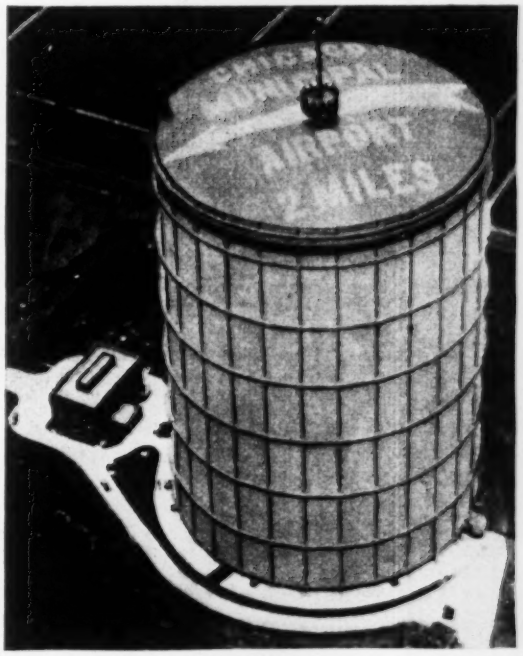


Fig. 1—World's largest gasholder, located in Chicago, is marked and serves as an aviation landmark

supported by nearly 500 concrete piles, most of these being poured in place (Fig. 3). Anchorage against wind pressure is provided by four ½-in. foundation bolts, which are attached to and embedded in the piles. This base ring is inclosed in an 18-in. circular concrete wall 4 ft. deep.

Vertical I-beams, placed with webs radial, form the corners of the polygon and serve as guides for the rollers on the piston. To these beams are attached plates 30 in. high and 31 ft. long, flanged at top and bottom for

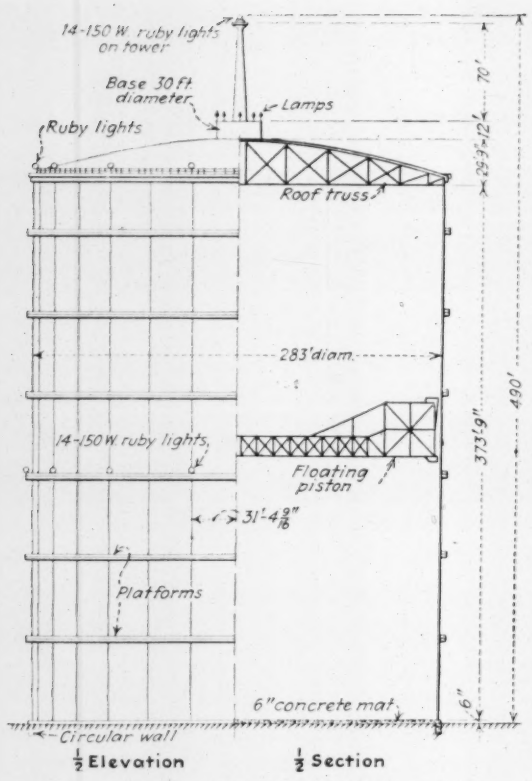


Fig. 2—Gasholder with floating piston

riveted connection and forming circular stiffening ribs, as shown in Fig. 3. The roof plating is carried by 28 radial trusses. A similar arrangement of trusses is used for the piston, which weighs 1,133 tons, or 1,612 tons with tar and concrete loading blocks. But the depth of the piston trusses at the outer end is about 40 ft., in order to form the trough for the tar seal (Fig. 3). Guide rollers on the ends of the trusses ride against the

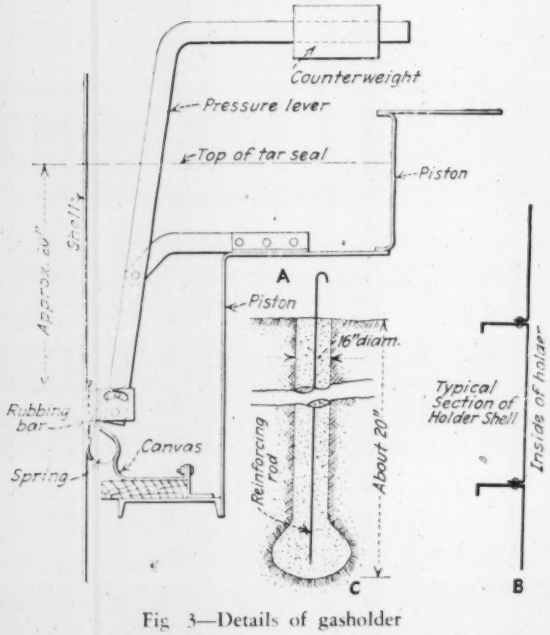


Fig. 3—Details of gasholder

A—tar seal of piston. *B*—section of tank shell, showing flanged plates forming ring braces. *C*—foundation pile and anchorage for base ring.

vertical I-beams. To make the seal gas-tight, rubbing bars on the piston are held against the tank walls by pivoted and counterweighted levers, these bars being in the tar, which acts as a lubricant and seal. At the bottom of the tar cups is a strip of canvas, held in place by coiled springs fitted between the canvas and the rubbing bars. The gas pressure is about 10 in. of water, or 0.36 lb.

A special tar with a thickening point at 5 deg. below zero is used for the seal, and its depth is sufficient to overcome the gas pressure below. It is kept in circulation by fourteen pumps driven by motors of 7½ hp.; tar leaking past the seal drips down the sides and flows to a well, from which it is pumped back to a reservoir tank after any water has been removed in a separator. In cold weather 56 gas burners around the piston keep the tar soft and prevent water accumulation from freezing.

In erecting the structure the corner columns were first placed and guyed, then the piston was assembled a little above the ground, and above it the roof trusses, resting on the piston by temporary posts. As the side plating was built up, the piston and roof were raised by compressed air, the roof being finally attached to a top frame and its posts removed. An inclosed electric elevator extends to the roof, from which a suspended car, with guide cables attached to the piston, gives access to the interior.

This gas holder is utilized as an aviation landmark (Fig. 1). The tank is painted green, with 10-ft. bands of yellow and black in the upper portion. A 70-ft. tower on the roof carries a red light of 1,000 watts, while other red lights are arranged around the base of the tower and in two rings around the tank. The roof is black with a yellow arrow and the words "Chicago Municipal Airport, 2 miles" in 30-ft. yellow letters. Lights are turned on and off automatically by an astronomical clock and a photo-electric device controlled by the intensity of atmospheric light.

In addition to the 20,000,000-cu.ft. holder described above, the company has two 10,000,000-cu.ft. holders of similar type. Two relatively small holders were described in *Engineering News-Record*, March 12, 1925, p. 437. This waterless non-telescoping type of holder is the invention of K. Jagschitz, engineer of Maschinenfabrik Augsburg-Nurnberg Actien Gesellschaft, Germany. The Bartlett-Hayward Co., Baltimore, Md., as the owner of the American patent rights, designed and built the three holders for the Peoples Gas Light & Coke Co.

Garbage-Collection Costs in Milwaukee

Exclusive of depreciation and interest on investment, the cost of collecting and disposing of the garbage of Milwaukee, Wis., for 1930 was 72c. per capita for the 578,000 population served; per ton the cost was $8.99. The cost per ton for disposing of 49,000 tons was $2.74 and for collecting the 44,800 tons picked up by the city was $5.89 per ton. Complaints in 1924 were 7,711, against 372 in 1930. About 85 per cent of the garbage is hauled by trailer trains an average of 4.72 miles at a cost of $5.64 per ton ($4.07 for collection and $1.57 for hauling). Corresponding figures for the 12 per cent hauled directly 1.4 miles by team are $4.96 per ton ($3.80 for collection and $1.16 for hauling). For the remainder hauled by trucks an average of 3.5 miles, the cost was $9.02 per ton ($7.27 for collection and $1.75 for hauling). Leo L. Hannifin is superintendent of the bureau of garbage collection and disposal and David McKeith is commissioner of public works.

Current Researches on Steel Floors and Wind Design of Tall Buildings

By F. H. FRANKLAND
Director Engineering Service, American Institute of Steel Construction, New York City

Empire State Wind-Test Installation

THE RESEARCH COMMITTEE of the American Institute of Steel Construction, by arrangement with the owners, architects, engineer and contractors for the Empire State Building, has equipped this structure with instruments by the use of which data will be developed concerning the effects of wind stress upon tall buildings. The building is practically ideal as a structure on which to conduct this research, being symmetrical about its horizontal and vertical axes. It is so situated that, for some years to come at least, the greater part of its height stands apart from serious local interference in the wind stream from any direction.

The specific purpose of this investigation is to determine the effect of wind upon the stress in the steel columns of the tower, the pressure and suction of the wind upon the exterior walls, and the amplitude of the sway of the building as well as the frequency—or number of times per minute the building sways. In addition, records will be made at times of high wind velocity by the use of an anemometer mounted on the top of the tower, 1,250 ft. above the street.

There are 32 strain gages installed on eight tower columns at the 23d floor, consisting of ½-in. steel bars 50 in. long, the upper ends of which are weld-connected close to the outer edges of the two flanges of each column, the lower ends being connected to the actuating spindles of strain-gage dials and stud-bolted to steel mounts, which are, in turn, tap-bolted to the steel of the columns.

Ten similar gages are installed on five of the girders connected to the columns already referred to, so that the amount and kind of stress in the girders due to wind load may be determined.

The negative and positive wind pressures on the building—pressure and suction—are measured on the 36th, 55th and 75th floors by means of pipes running from the outside face of the walls to U tubes mounted in two recording station closets on each of the three floors. As the installation on each floor consists of ten pipes (three each on the longest sides of the building, the north and south, and two each on the east and west sides), it will be seen that the tower portion of the building is banded at three approximately equidistant heights with wind-pressure-recording instruments. The pipes are connected with a specially designed airtight coupling to holes drilled in the aluminum spandrels under the sills of windows, from where they run in the floor fill to mounting boxes on the walls of the recording station closets, ending in a rubber-hose connection to glass U tubes filled with colored water. Due to the fact that positive and negative pressures, respectively, will exist on the windward and leeward sides of the building, there will be pressure and suction indicated simultaneously in the group of tubes according to their connection with the windward and leeward sides.

The sway of the building is being observed by the use of a "collimator," a vertical-telescope instrument designed by the U. S. Coast and Geodetic Survey for the purpose of locating exactly the reading points of triangulation survey marks above their permanently set posts. This type of instrument was selected as being particularly fitted for the purpose of this research, and through the cooperation of the Coast and Geodetic Survey permission was obtained to have one made for the work. A fire shaft, running from the 6th to the 80th floor, offers an excellent opportunity for the sway observations—the collimator at the bottom of this shaft providing a vertical line of sight over 900 ft. long. At the 85th-floor level is an illuminated target, marked to permit readings of the tower movements in any direction.

Combustible load used in battledeck floor tests

The method of recording the observations of the strain gages on the columns and girders, of the U-tube wind-pressure readings and of the anemometer dial readings is by means of electrically controlled moving-picture cameras housed in removable metal boxes at the various recording stations. All of the recording stations are electrically interconnected and controlled from a master switchboard. The cameras may be set to take one picture at a time or a series of pictures at the desire of the observer. A light switch on the board controls the electric-lamp illumination for photographic purposes, and a camera-operating switch is electrically interconnected so that a tell-tale signal lamp on the control board indicates whether the circuit is complete and ready for action. At one of the recording stations is a master watch, mounted within the field of the moving-picture film, so

[—From reports made at the annual meeting of the American Institute of Steel Construction]

COMPARISON OF FIRE-TEST RESULTS ON BATTLEDECK FLOOR

Test No.	Floor Finish	Protection Below Floor	Combustibles Lb. Per Sq.Ft.	Max. Temperature, Deg. F. Over Floor	Max. Temperature, Deg. F. Floor Plate	Max. Temperature, Deg. F. Lower Flange of Beams	Max. Deflection of Floor, In.
1	Bare plate	¾-in. gypsum plaster on suspended metal lath	10	1,320	828	536	2.69 (18-ft. span)
2	Bare plate	do.	10	1,486	864	729	1.76 do.
3	Battleship linoleum laid in mastic	do.	15	1,636	891	621	4.43 do.
4	¾-in. Unicrete	do.	20	1,771	819*	615	3.5 do.
5	1½-in. Aerocrete, laid on expanded metal with ½-in. cement finish	do.	30	1,768	565†	437	(1.77 in. after cooling) 0.87 (13-ft. span) (0.33 in. after cooling)
6	1½-in. concrete reinforced with steel mesh ½-in. Hydrocal mastic floor topping	2-in. gypsum block and ½-in. gypsum plaster	40	1,696	868‡	741	2.25 (13-ft. span) (1.44 in. after cooling) (1.18 in. after removing live load)

*This temperature was reached only after 9½ hours. After 4 hours the plate temperature had reached only 300 deg.
†This temperature was reached only after 18 hours. After 3 hours the plate temperature was 212 deg., and after 8 hours 313 deg.
‡This temperature was reached only after 19 hours. After 6 hours the plate temperature was only 205 deg.

that, as the photographs at all stations are taken simultaneously, the exact time of the record is reproduced on the film. It is seen that, by these expedients, an easy and accurate control is possible of the photographic records. The collimator will be visually read, the readings being exactly timed by a watch set with the master watch referred to above.

Upon receipt of storm warnings from the local weather bureau the observers check and set the recording instruments ready for action at any chosen moment.

The Bureau of Standards has taken advantage of the opportunity offered by the Institute's wind-stress research by completing recently in the Bureau's laboratory at Washington a model 5 ft. high of the Empire State Building, on a scale of 1:250. The model has been placed in the Bureau's 10-ft. wind tunnel, and pressures developed by winds up to 60 m.p.h. are being measured. The resulting data will not be completed for several months.

The Bureau believes that, in the field of wind pressure, the utility and validity of model tests have not as yet been adequately recognized, mainly because of the lack of opportunities for satisfactory comparisons between model and full-scale structures. Under the circumstances set up by the Institute's work on the Empire State Building such an opportunity was created, which will serve to develop invaluable information as an aid in the design of other tall structures.

* * *

Fire Tests of Battledeck Floors

IN LOAD and fire tests of battledeck floors, in progress at the Bureau of Standards, a load test (without fire) and a series of fire and load tests with fire on top of the floor have been completed. Further tests are to be made with fire applied below the floor and with both fire and water applied below the floor.

Load Tests Without Fire—The floor panel was 13½x18 ft., made up of 4-in. 7.7-lb. I-beams spaced at 24 in., covered by ¼-in. steel plates 24 in. wide attached to the top flanges of the beams and to each other by continuous butt welds. The ends of the panel rested on shelf angles in a rigid supporting frame and were restrained by an angle, one leg of which was welded on top of the floor plate and the other bolted to the frame.

Pig-iron loading was applied progressively up to 420 lb. per sq.ft. The design load for 18,000-lb. stress was 105 lb. per sq.ft. Deflections and strains were read up to a load of 220 lb. per sq.ft., when the proportional limit of the beams was reached.

LOAD TESTS OF BATTLEDECK FLOOR

Live Load Lb. per sq.ft.	Deflection, In. Calculated	Deflection, In. Measured	Stresses
105 Design load	0.255	0.53	For loads up to 220 lb. per sq.ft. the stresses computed from strain-gage measurements agreed with those calculated when position of inflection point was taken into account.
420 (Left on 5¾ days)	.....	4.0 (2.75 after removal of load)	

The welds proved adequate to produce integral action of the plates and beams in withstanding the bending stresses. The end fixation resulting from the presence of the restraining angle was less than that in a fixed-end beam. At 420-lb. load the floor did not fail, but the members of the frame were so twisted that loading had to be discontinued.

Fire on Top of Floor—Floor of ¼-in. plate on 4-in. 7.7-lb. I-beams (in test 4, 5-in. 10-lb. beams). Span full length in tests 1–4; divided by intermediate girder in tests 5 and 6. Ends of panel simply supported in tests 2 and 6, restrained by top angle in tests 1, 3, 4 and 5.

In each test the floor was loaded to 18,000 lb. stress in the bottom flanges of the beams, or about 3,000 lb. compression in the plate. This load, which included the weight of the combustible, ranged from 70 lb. (dead plus live) to 200 lb. in the different tests. As the combustible burned out, the total load decreased by 10 to 25 per cent during the test.

Distribution of Unaccounted-for Water

Unaccounted-for water was allocated by P. J. Hurtgen, director of public works, Kenosha, in a paper recently read before the Wisconsin section of the American Water Works Association, to three major items: under-registration of meters, service leakage and main leakage. Upon combining the data obtained by pitometer surveys of the distribution systems of seven Wisconsin cities, it was found that the water accounted for represented 89 per cent of the total pumpage. The remaining 11 per cent unaccounted for was made up of 4.5 per cent through incorrectly registering meters, 5.2 per cent through leaky service pipes and 1.3 per cent through main leakage. All but 14 per cent of Kenosha's pumpage was accounted for, nearly all of which was attributable to errors in the registration of large meters. After testing practically all the meters in one billing district and repairing the inaccurate ones, the district revenue increased in two years from $20,000 to $22,000, although very few residences had been built in the meantime. Tests on eight new meters indicate that household meters are not designed to register the small fixture leaks.

Stringing Rope-Strand Cables Features St. Johns Bridge Construction

•Fig. 1—St. Johns bridge, Portland, Ore., establishes a record span of 1,207 ft. for rope-strand cable type

Cables for 1,207-ft. span at Portland, Ore., erected in 23 days without footwalks—Advantages of stranded design discussed—Erection system of endless hauling ropes described—Foundation and approach construction outlined

By R. BOBLOW

Resident Engineer, Robinson & Steinman, Consulting Engineers, New York City

DISTINGUISHED by the largest rope-strand cables ever erected and thoroughness of architectural treatment, the St. Johns bridge at Portland, Ore., has the further distinction of being the first modern suspension bridge of major size ever built on the Pacific Coast. The structure was built by Multnomah County and spans the Willamette River about 7 miles northwest of the business district, connecting the section of the city known as St. Johns with Linnton. In accordance with federal requirements, a clearance of 205 ft. at the center of the main span is provided, and a 203.6-ft. clearance for a channel width of 440 ft. The project cost $4,000,000 and was opened to traffic June 13, 1931.

The structure is a typical stiffened suspension bridge with suspended side spans, having two-hinged stiffening trusses, fixed main towers, and cable bents on rocker castings for the purpose of deflecting the cables to permit favorable locations and economical design of the anchorages. The main span is 1,207 ft. long and is flanked by two 430-ft. side spans. Spaced 52 ft. apart, the two cables are 16¾ in. in diameter and support stiffening trusses of conventional Warren type 18 ft. deep, or the equivalent of 1/67 the length of the main span. The roadway is 40 ft. wide between curbs, providing for four lanes of traffic; in addition there are two 5-ft. sidewalks. The roadway deck and sidewalks are of reinforced-concrete slab construction. Design features of the structure were described in detail in *Engineering News-Record*, Feb. 13, 1930, p. 272.

The St. Johns bridge exceeds the Grand 'Mere bridge, where rope-strand cables for a long span were first introduced, both in span and size of cables. Further, erection of the latter structure occurred during the winter season in Quebec, and the frozen surface of the river was utilized for stringing the cables (*Engineering News-Record*, Nov. 18, 1929, p. 841). Thus the St. Johns bridge provided the first real opportunity in working out problems of erection procedure for rope-strand cables under conditions that may be considered as normal.

Approaches—The approaches to the bridge, 1,511 ft. long on the east side and 255 ft. on the west, are made up of a series of steel deck-truss spans having lengths of 108, 144, and 180 ft. A concrete U abutment, 227 ft. in length, is used at the east end of the bridge to provide the necessary flaring out of the roadway to connections with existing streets. The west approach leads into the side of a hill at a point about 120 ft. above a main highway, which necessitated the construction of a two-branch road cut in the hillside and dropping on a 5 per cent grade both ways from the bridge terminal to junctions with the road.

Erection of the approach trusses was by means of a jinniwink deck traveler equipped with a 50-ft. boom of 10½-ton capacity and operating on the roadway stringers. For the 108-ft. spans a single bent of falsework was used, midway between the piers, the trusses being assembled on the ground and picked up in half-span units. For the longer spans a tower bent of falsework was used (Fig. 2). The falsework was shifted as erection proceeded by means of a trolley on a 1-in.-diameter cableway spanning the length of the approach. The viaduct steel contract involved the fabrication and erection of 1,943 tons of structural steel.

The viaduct spans are supported on tall slender viaduct piers forming a very impressive progression of increasing heights, their tops varying from 22 to 150 ft. above the ground. The two tapering shafts of each pier rise from a heavily reinforced concrete base and

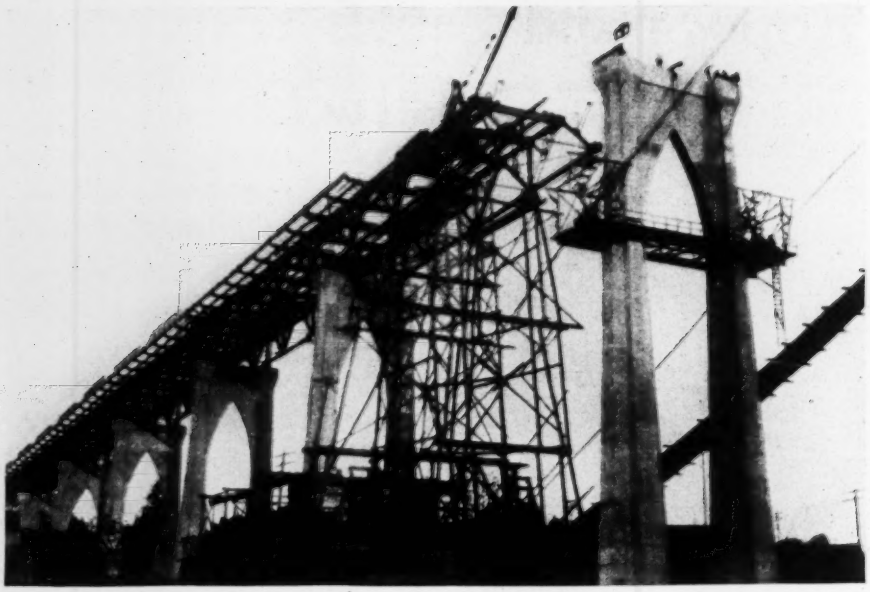


Fig. 2—Viaduct approach on pointed arch piers
Timber tower-erection bent was shifted by cableway.

converge to form an impressive arch. These piers are reinforced by means of rigid structural-steel frames set 4 in. from the face of the concrete. They were poured (Fig. 3) by means of steel concreting towers in vertical lifts of 20 ft. Forms were fabricated in suitable panels and hoisted by a boom supported on the concreting tower. The rigidity of the structural-steel frame contributed greatly toward the perfection of shape and line attained in the construction of the viaduct piers, since they provided a practically inflexible support for the forms.

Main Piers and Anchorages—The two main river piers extend to an elevation of 60 ft. above mean low water. The east pier rests upon 1,068 wood piles driven into a hard formation of black sand by an air-driven hammer, set in 90-ft. telescopic leads to permit the hammer to follow the pile under water to refusal. The base of this pier is 50 ft. below low water. The west main pier is keyed into solid rock at El. —21. Both main piers were constructed by open-caisson method, using seals poured by tremie. An unusual design feature for the main piers is the use of 72-in. wood-stave pipes on 9-ft. centers throughout the piers for the purpose of saving concrete.

The topography of the site required two types of anchorages: the more common gravity type on the east side and the more economical tunnel type on the west side. Each anchorage is required to resist a cable pull of 8,500 tons. The east anchorage is an outstanding structure 115 x 91 ft. in plan and 50 ft. high, containing 12,500 cu.yd. of concrete. Heavily reinforced concrete walls within the anchorage divide it into chambers, some of which are filled with sand and others left open to permit inspection of the cable connections. Including the weight and loads of the viaduct pier, which rests upon the rear of the anchorage, the total weight available for resisting the pull of the cables amounts to 29,000 tons. This anchorage rests on 516 concrete pedestal piles; 192 were driven on a batter of 1 to 4, approximating the slope of the resultant force acting on the anchorage.

On the west side the anchorage steel for each cable is embedded in concrete filling a tunnel excavated for a distance of 80 ft. into dense basaltic rock and tapering from a 14 x 14-ft. section at the portal to a 24 x 27-ft. section at the rear. Incidentally, about 40,000 cu.yd. of concrete used in the viaduct piers, anchorages and roadway deck was manufactured and delivered by mixer trucks.

Main Towers—The two main steel towers of the bridge offer a variety of interesting features. Their design embodies a combination of vertical and battered main posts combining the structural advantages of both types. The conventional crisscross bracing is supplanted by lofty pointed arches, one above and the other below the roadway level, thus retaining the architectural impression created in the viaduct piers. The tower rises 290 ft. above the concrete pier, weighs 1,250 tons and is of the flexible type, being fixed at the base to the concrete pier by means of 2½-in. anchor bolts. Each tower was erected by means of a wooden stiff-leg derrick resting on top of a 300-ft. timber tower erected on the shore side of each main pier. This feature of construc-

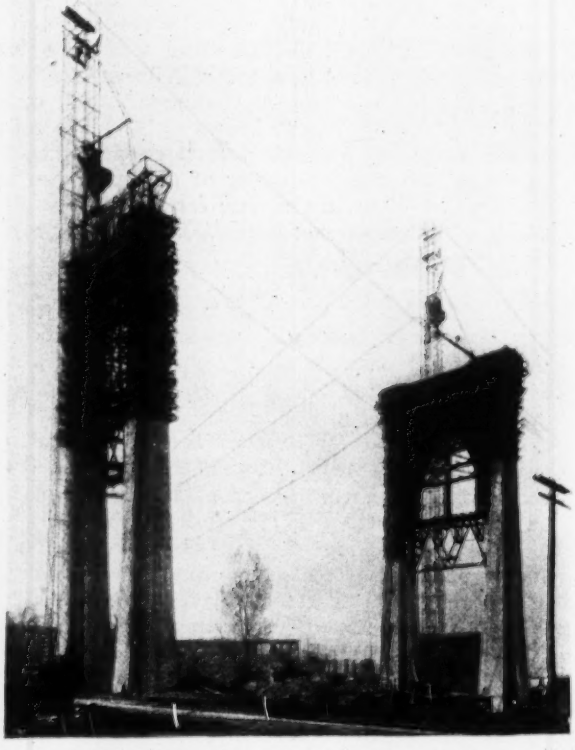


Fig. 3—Concreting operations for viaduct piers
Pier reinforcing is a structural-steel frame, which was essential in attaining correct shape and line by providing a rigid support for the forms.

tion procedure was described and illustrated in *Engineering News-Record*, Nov. 13, 1930, p. 770. Each tower is surmounted by two 50-ft. copper-sheathed steel spires, supporting aviation beacon lights equipped with flashers.

Rope-Strand Cables—The two main cables are 52 ft. apart and have a length of about 2,720 ft. between anchorage fastenings. Each cable consists of 91 1½-in. galvanized-wire bridge strands, which, in turn, are made up of 51 galvanized wires, varying in diameter from 0.100 to 0.196 in. and aggregating a gross metallic area of 1.337 sq.in. All wire for the main cables, suspender ropes and hand ropes was specified to be cold-drawn and manufactured by the acid open-hearth process. Each main cable strand was specified to have an ultimate strength of 135 tons, a yield point of 200,000 lb. measured at 0.7 per cent elongation, and a modulus of elasticity of not less than 24,000,000 lb. up to a load equal to 50 per cent of the specified ultimate strength.

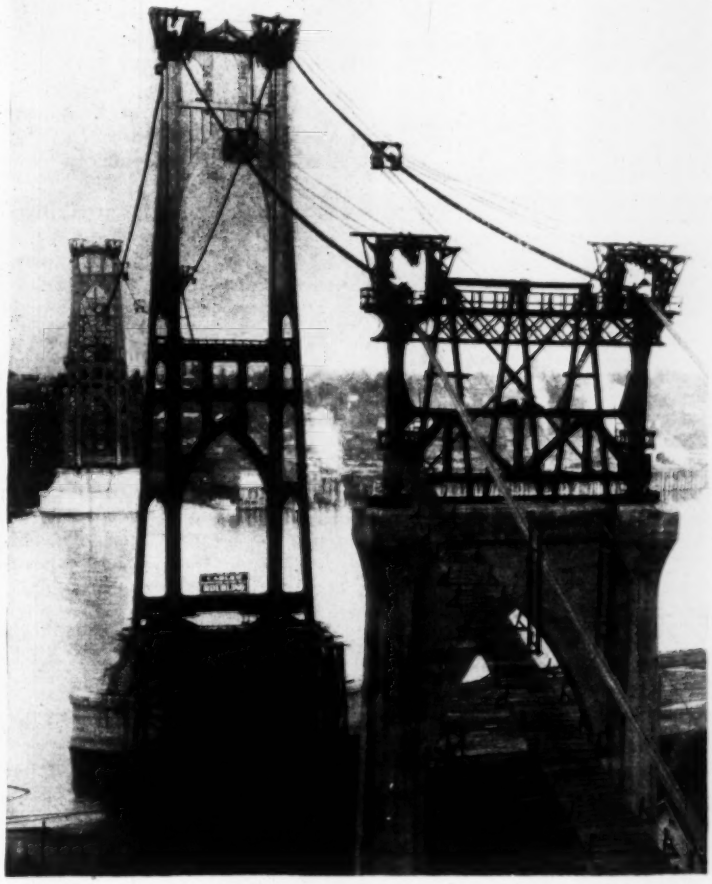


Fig. 4—Layout of cable-stringing operations

A system of hauling ropes and the cages suspended from track ropes permitted elimination of footwalks for erection. Each precut and socketed 1½-in. strand, 2,720 ft. long between anchorages, was delivered on separate reel and hauled across the river by continuous loop rope. The 182 strands in the two cables were strung in 23 working days.

It has always been recognized that a suspension bridge cable composed of wire ropes or strands cut to predetermined length would have advantages in economy over the parallel-wire type of cable. The main considerations that prevented the use of rope-strand cables for long-span suspension bridges carrying modern traffic were the lack of uniformity and dependability of the elastic properties for such ropes, as well as the much lower modulus value of the twisted strand compared to the individual wires composing it. A parallel-wire cable can be depended upon to have a modulus of elasticity equal to that of the wires composing it—namely, very close to 27,000,000 lb. per sq.in.; whereas, a rope under its first stressing has a modulus of about 12,000,000 lb., which may vary considerably depending upon size of rope and care in manufacture. Since the stiffness of the cable is of such vital importance in overcoming any excessive elasticity in a suspension bridge, it was essential to overcome these disadvantages of twisted strands in respect to elastic properties before consideration could be given to their use in a bridge cable.

To accomplish this purpose, each strand was subjected to a prestressing treatment prior to cutting. A load of 150,000 lb. per strand applied for one-half hour was sufficient to close the wires in the strand and thus remove the "inelastic" stretch to an extent sufficient to guarantee a modulus of elasticity of 24,000,000 lb. for the strand after such treatment.

Strands for the St. Johns bridge cables were treated accordingly. After application of the 150,000-lb. load for a half-hour period, the load was decreased to 70,000 lb. (closely approximating the dead-load stress in the completed structure), and the strand was then cut to predetermined length and socketed. Each strand was then coiled on a wooden reel and shipped to the site. Such a unit weighed about 6½ tons.

Cables

The economy of the twisted-strand cable over the parallel-wire type lies mainly in the field work, since the major operation of building the wires into strands (of necessity a field operation for the parallel-wire type of cable) becomes a shop operation and may be carried on while work preliminary to cable erection is in progress. It should be possible to erect rope strands in 60 per cent of the time required for parallel wires.

In an effort toward further erection economy the contractor did not use a footbridge for a working platform in stringing the cables. In place of this conventional erection practice, the installation consisted of a system of track ropes, cages and hauling lines to draw the strands across the river. The fixed ropes consisted of four 1-in. strands, known as track ropes; two of them spaced on 10-ft. centers served each cable. These track ropes supported and acted as guides for steel cages located at center and quarter points of the main span and center of the side spans. The cages served as working platforms for erection and adjustment of the main cable strands. The movable ropes consisted of an upper 1-in. hauling rope and a lower ¾-in. hauling rope, each forming a continuous loop serving both cables and passing through tightening frames located at the east anchorage to take up the stretch in the rope developed by use.

Each of the hauling ropes could be moved inde-

pendently by means of electric machinery installed on the west anchorage. The steel cages could be fastened to the upper hauling rope when it was desired to shift their positions along the track ropes. The longer ¾-in. hauling rope was the actual means of pulling the strands across the river.

The reel containing the strand was set in a reel stand on the east anchorage. The strand socket was then attached to the hauling rope by a coupling, shown in Fig. 5, and the strand was pulled across the river over the tops of cable bents and main towers to the west

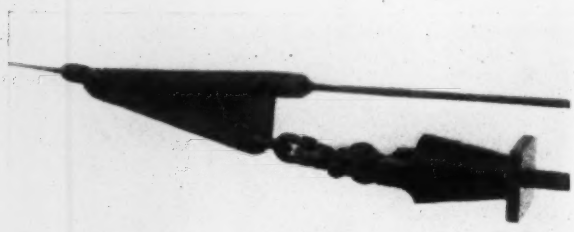


Fig. 5—Swivel connection of hauling rope to strand socket

This special fastening, permitting strand to twist independently of rope, was an important field development in cable-stringing, eliminating previous delays caused by twisting of the two units.

anchorage. To control the sag of the strand as it was being hauled across the river, steel U-shaped guides were hung from the upper tramway rope at 120-ft. intervals and the bridge strands pulled through these guides. The general arrangement of this cable-stringing operation is shown in Fig. 4.

The attaching of the strand sockets at the anchorages consisted in locking the sockets between a series of vertical plates pinned to the main anchorage bars. Each socket bears against a series of castings bolted between the vertical plates. Final adjustment of the strand to precalculated sag was controlled by means of shims inserted between the strand socket and the casting.

Strand Twisting Eliminated

Actual erection and adjustment of the main cable strands was accomplished in 23 working days. The main difficulty met at the start was the twisting of the strand around the hauling rope, which necessitated untwisting—an operation both cumbersome and time wasting. This condition was finally corrected by the use of a special swivel that permitted the strand to twist independently of the hauling rope (Fig. 5). This freedom to twist naturally resulted in a slight change of strand length, which was corrected by the shim adjustment. The maximum number of strands erected per day was sixteen. Adjustments were made before sunrise or after sunset or in cloudy weather to eliminate the uncertain effect of the sun.

Following the completion of the strand stringing, the cable bands were placed at points measured along the cables in the field. Since the 91 cable strands as erected formed a regular hexagon, the inside faces of the cable-band casting formed a corresponding figure and, in addition, were grooved to fit the individual outside strands. With these bands in position the suspender ropes were hoisted. These are 1⅝ in. in diameter, two of them being looped over each cable band to provide four parts of line at each point of connection to the stiffening trusses. Each suspender rope was also prestressed prior to cutting, a load of 100,000 lb. being applied for a period of half an hour. This load was then reduced to 35,000 lb. and the rope marked for cutting under that load. The specified ultimate strength for each rope was 212,000 lb., and the modulus of elasticity 14,000,000 lb. Suspender-rope erection was followed immediately by erection of the stiffening trusses.

Stiffening-Truss Erection

Prior to hoisting the stiffening trusses the members were riveted into double-panel units, 36 ft. long and weighing 10 tons each. These units were hoisted from barges by means of falls suspended directly from the main cables, and wooden segmental collars were placed around the cables to protect the galvanized wires from abrasion. The schedule of erection for the suspended steel was planned to keep the weights balanced about each main pier to prevent excessive tower deflection. Erection was begun at the center of the main span and at the cable bents and progressed symmetrically from these points toward the main towers.

Cable wrapping, begun upon completion of steel erection, was preceded by two coats of paint applied to the cables. Then the flat surfaces of the cables were covered with segmental strips of cedar about 6 ft. long to transform the hexagonal cable cross-section into a circular one more suitable for wrapping. The cedar strips had been treated by immersion for a period of 20 min. in linseed oil at a temperature of 200 deg. F. The wrapping consisted of a continuous serving of No. 9 soft annealed double-galvanized steel wire applied by a motor-driven machine on each cable. The end of each cable band was counterbored to permit tucking in the wrapping wire, and the space was then caulked with lead wool. Following wrapping, three coats of paint were applied, the diameter of the completed cable being 16¾ in.

The pouring of the concrete deck slab and sidewalks was carried on simultaneously with the cable wrapping in accordance with a schedule laid out to prevent excessive main-tower deflections, as was done for the erection of the suspended steel.

The bridge was built by Multnomah County at a cost of very nearly $4,000,000—about $250,000 less than the estimate of the engineers. Robinson and Steinman, New York, designed and supervised the construction of the project. The work was let in seven main contracts as follows: Gilpin Construction Co., Portland, Ore.—foundations; Wallace Bridge & Structural Steel Co., Seattle, Wash.—suspension bridge superstructure; John A. Roebling's Sons Co., Trenton, N. J.—cables; La Pointe Construction Co., Portland, Ore.—west approach roads; Columbia Steel Co., Portland, Ore.—approach superstructure; Lindstrom & Feigenson, Portland, Ore.—roadway slab and sidewalks; National Electric Co., Portland, Ore.—electrical work.

The principal subcontractors were the following: Pacific Bridge Co., Portland, Ore.—river piers; J. H. Pomeroy Co., Portland, Ore.—erection of suspension-bridge structural steel; American Bridge Co.—viaduct steel.

The Robert W. Hunt Co. supervised the inspection of the fabrication and erection of all steel, and the Northwest Testing Laboratories inspected all concrete. The entire project was completed in a period of 21½ months.

LETTERS TO THE EDITOR

Willis A. Slater

Sir—I read with interest the notes by Prof. Hale Sutherland, of Lehigh University on the career of the late Willis A. Slater, published in your issue of Oct. 22, and I should like to add my tribute to his memory. The feelings of those who were closely associated with Prof. Slater are so strong that it is difficult to put them into words. Some added remarks on his career may be proper.

Prof. Slater's work was always characterized by thoroughness, accuracy and good sense. These qualities shown in the conduct of his undergraduate thesis attracted the attention of Prof. A. N. Talbot, and this led to his appointment on the engineering station staff of the University of Illinois in 1908. During the following decade here, at a period in which laboratory and field tests on reinforced-concrete structures were doing much to clarify and explain the action of such structures, Slater, working with Talbot, Lord, Abrams, Gonnerman and others, made many investigations that were of permanent value to the profession. His work on reinforced-concrete pipe, footings, columns and wide beams was outstanding, and he was one of the first to make extensometer tests of full-sized building structures, a field of work in which no other man has conducted as many or as extensive tests. The influence of this work on the development of concrete buildings cannot be estimated.

Prof. Slater was an unusually good judge of men and had the ability to stimulate their development. He was scrupulously careful that full credit for work done should be given to his associates.

Slater's friends and coworkers admired him for his intense thoroughness and intellectual integrity, which permitted him to pass judgment on no question which he did not completely understand and which carried him on to seemingly tireless efforts in an investigational task. He possessed an indomitable will that drove him to perform an amazing list of professional accomplishments carried through periods of ill health. But most of all, his friends loved him for the kindly and unselfish spirit that was an outstanding characteristic of the man. Thoughtful, considerate and generous in his professional as well as in his personal relations, he leaves a host of friends who mourn the passing of his friendly spirit, his whole-hearted cooperation and his sound good judgment.

M. L. ENGER,
Head Department of Theoretical and Applied Science, University of Illinois.

Urbana, Ill.
Oct. 22, 1931.

Emergency Relief Work

Sir—For some months the writer has been thinking and talking substantially the same ideas you have so admirably expressed in one of your recent editorials under the caption "Work for All."

Scarcely any defeat inflicted by a more powerful enemy in war could bring about a more cataclysmic degree of debasing misery than has been caused by the existing business depression. By raising sufficient money in the same manner as for war, our government can guarantee steady work to all of those not absorbed in the regular pursuits of industry. We can check present conditions by issuing bonds to put to work all of the unemployed and keep them employed until industry needs them. If we cannot in prosperous times pay for keeping excess labor busy during periods of depression, our entire capitalistic system is indeed a miserable failure and must be completely changed or radically modified.

But merely voting the necessary funds for this occasion is not enough. We must adopt a thorough national economic policy that will go into effect automatically when the need arises independent of political considerations. It must provide a permanent national system for using all excess labor on projects that will be economically beneficial. When we shall have a national policy whereby we can and will keep every excess worker employed, there will be no cause for fear. Every man will know that he is assured of work. Therefore no one will especially worry whether there is a temporary business lull or not. Consumption will remain about normal at all times, because everyone will be working.

There are those who contend that our federal government must not interfere in this or any other way; that we must let conditions sink to these depths and then take care of the sufferers with charity, the dole, unemployment insurance or local relief efforts. Others demand that industry assume the burden independent of governmental efforts or interference. Industry is totally unorganized for such highly collective efforts. We already have a well-established structure in our federal government possessing all the necessary powers of financing, administration and taxation.

All forms of relief other than useful employment are decided economic losses while there is no end to the economically gainful work that can be performed. I disagree with those who contend that all such emergency relief work should consist of projects that would be within the scope of normal programs anyway. Such a course would serve to disarrange and disturb employment in otherwise normal periods. This should be avoided. However, there are unlimited numbers of projects that would not ordinarily be entertained, because of more pressing considerations, which would still be of great economic benefit if performed. I can think of many: a system of interstate express highways built as substantially and as well as railways, reforestation and development of a great chain of state and national parking systems, flood control throughout the country, drainage projects and mosquito eradication, and other sanitary projects not ordinarly practicable.

HOMER G. SHOCKLEY.

New York City
Sept. 26, 1931

The Highest Sprinklered Building

Sir—In your Oct. 8 issue J. A. Fouilhoux' interesting article on the new McGraw-Hill Building states that "it is believed that the McGraw-Hill Building is the highest sprinklered structure yet built."

As a matter of fact the Navarre Building, southwest corner of Seventh Ave. and 38th St., in New York City, is sprinklered throughout its entire 43 stories, although not in the elevator machinery and tank-room levels, which are the 44th and 45th story levels respectively. The Navarre Building is 553 ft. 5 in. high from curb to top of topmost parapet wall, and the tank-room floor, which forms the ceiling of the 43d story, is 504 ft. 2 in. above the curb. In Mr. Fouilhoux' article the height of the McGraw-Hill Building is given as 483 ft. 3 in. According to the last information given to us, the Navarre Building is the highest sprinklered building in the world.

EADIE, FREUND & CAMPBELL,
Consulting Engineers.

New York City,
Oct. 14, 1931.

Grouting Solves Unwatering Problem

Sir—The article in *Engineering News-Record* of Oct. 15, p. 610, by E. O. Goldstein on sealing a bridge cofferdam by grouting recalls a grouting operation for constructing the bottom of a circular Imhoff tank built several years ago under my plans and specifications. The tank wall was of brick in 1 : 3 portland cement mortar and was first sunk as a caisson on a wooden shoe with matched plank cutting edge, the excavation being made as the wall sank. The ground material was loose and open gravel and much pumping of water was required for excavating inside the wall to allow the caisson to sink. The normal level of the groundwater was within 2 ft. of the ground surface and the lowest point of the tank bottom was 25 ft. below the ground level. The bottom was conical and constructed of brick in 1 : 3 mortar.

After the caisson was sunk to the required depth, the difficulty in keeping the water pumped down to satisfactorily construct the bottom became apparent. At my suggestion the contractor allowed the tank to fill with water, drove two pipes vertically a few feet into the bottom gravel, these pipes being pointed on lower ends with ¼-in. perforations near their bottom, and extended upward to above the water line

They were spaced 3 to 5 ft. apart. Their upper ends were connected with a pump which forced a thick cement mortar through the perforations and into the surrounding gravel. Pumping of the grout through each pipe was continued until mortar was seen to come up into the supernatant water.

After the gravel was considered to be thoroughly grouted the work was allowed to rest for a few days for the grouting to harden and the water in the tank was then pumped out. There was so little leakage into the tank that the contractor has no difficulty in placing the bottom in a watertight manner. The grouted gravel made a weak concrete and was easily shaped to receive the brick bottom. Had the grouting not been carried deeply, it would not have withstood the upward water pressure.

CHARLES C. HOPKINS,
Consulting Engineer.

Rochester, N. Y.
Oct. 19, 1931.

Bowstring Arches

Sir—An interesting derivation of the design equations of a bowstring arch was made by C. B. McCullough in his article "Design of a Concrete Bowstring Arch Bridge, Including Analysis of Theory" (*ENR*, Aug. 27, 1931).

The writer wishes to extend the theory to the cases of the bowstring arches that were not discussed by the author. Often the bending effect of the floor or arch tie is small and the redundant component forces Z and Y may be neglected without any material error. Therefore only one equation (13) in addition to the equations from statics will be needed to solve the arch. In this case the redundant X may be assumed acting along the center line of the tie.

The equations were developed by the author with the assumption that the modulus of elasticity is constant for all members of the arch. However, in a bowstring arch of reinforced concrete the stresses in the tie are usually carried by the reinforcing steel and therefore the modulus of elasticity of steel should be included in the equations. Considering the effect of a distortion of the tie from the equation (8) we may write:

$$\delta_{xx} = \Sigma\, Gy^2 + \frac{l}{A_s E_s} \qquad (17)$$

Where, A_s = area of cross-section of steel in the tie
E_s = modulus of elasticity of steel

Whence:

$$\Delta X = \frac{\Sigma\, M_o G y + \Sigma\, N_o \dfrac{dx}{AE}}{\Sigma\, Gy^2 + \dfrac{l}{A_s E_s}} \qquad (18)$$

A. A. EREMIN,
Assistant Design Engineer
Bridge Department, State Highway Commission.

Sacramento, Calif.,
Sept. 15, 1931.

Cost of Through Cantilever Bridges

Sir—Referring to the letter of H. G. Perring in your issue of Oct. 1, p. 540, commenting on the through cantilever concrete bridge in Scotland, the detail facts will, I think, throw a different light on his criticisms. The cost given of $435,000 was inclusive of all expenses in addition to engineering construction.

The following are the details relating to construction costs:

Temporary bridge and demolition	$50,000
Foundations and piers in river	150,000
Superstructure	100,000
Road works	25,000

The design load for the bridge is approximately equivalent to 200 lb. per sq.ft., which I think is somewhat greater than is customary in the United States. While the old abutments were used in the counterbalance, they were not called upon to take any considerable proportion of the total load of the new bridge, this being a condition of the design.

Regarding your correspondent's last paragraph, I think he will find he is making a mistake in the decimal point. The working load on piles was not considered to be greater than 30 tons each.

It is always difficult to compare costs of bridges without complete details and I think this is a case in point.

It is interesting that a competitive design for this bridge in structural steelwork came out at a higher figure. Possibly this is the best indication of the economy of the design adopted.

E. WILLIAM OWEN,
Consulting Engineer.

London, England.
Oct. 13, 1931.

Sounder Building

Sir—I like very much the editorial "Sounder Building" in your Oct. 22 issue. You are to be congratulated on your effort to call attention to the fundamental importance of providing sufficient money at reasonable rates of interest and commissions for building. This is especially true in the small building and housing field.

At this time, when nearly everyone seems to have a pet "cure-all" for the present general depression, and especially the building slump, I hesitate to offer any comment, but I believe that no more far-reaching and effective solution to improve and stabilize building conditions has been made than the plan for a federal mortgage discount bank. We are told by building and loan people, insurance companies and others that there is ample money for home building, but by the time it passes through the hands of realtors, brokers and so forth the cost of the money is so high that it is nearly impossible even to consider building.

Good construction can be had at very nearly the same price as shoddy construction, and the agency arranging the financing of a proposed home is in the best position to dictate the quality of the construction.

W. D. M ALLAN,
Manager, Cement Products Bureau
Portland Cement Association.

Chicago, Ill.,
Oct. 24, 1931.

Bibliography of the Vierendeel Truss

Sir—In connection with the article "The Vierendeel Truss" by Dana Young in your Aug. 13 issue, a short bibliography on the subject may be of interest. Prof. Vierendeel presented a paper before the Société des Ingénieurs Civils de France in August, 1900, in which he sums up all the work done on his original idea of a truss without diagonals since its first presentation in 1895, and proceeds to set down a complete theory for the analysis of his truss system. In this paper, the following publications are listed as being the most important on the subject up to that time:

"Les ponts architecturaux en métal," by A. Vierendeel in the *Annales* des Travaux Publics de Belgique, 1896.

"Longerons en Treillis, et Longerons à Arcades," by A. Vierendeel, April, 1897. This paper gives the first method for the calculation of trusses without diagonals.

"Le Pont Systèmbe Vierendeel," by A. Vierendeel, January, 1898; describing the experiments at Tervueren-lez-Bruxelles.

"Le Pont Vierendeel," by Lambin and Christophe, Ingénieurs des Ponts et Chau sées, in the *Annales* des Travaux Publics de Belgique, 1898. A report on the experiments at Tervueren.

"Le Pont Vierendeel," by A. Vierendeel, March, 1898. A study of the above report.

"Note sur le Calcul du Pont Vierendeel." by E. Haerens, 1898.

Boletin de la Sosiedad de Injeniera (Chile), by R. Claro-Solar, 1898.

Giornale del Genio Civile (Italy) 1899, by Prof. Andruzzi, a translation of which appears in *Bulletin* Technique de l'Union des Ingénieurs Sortis des Ecoles Spéciales de Louvain, 1899.

Recently considerable discussion has been aroused concerning the height of the point of contraflexure in the vertical members of the truss, and a series of articles has appeared in the *Revue Universelle des Mines* in which various solutions of the problem are advanced. The references are as follows: July 15, 1926, p. 69, by P. Thomas; Aug. 1, 1929, p. 71, by F. Campus; Nov. 15, 1929, p. 294; March 1, 1930, p. 129, by A. Vierendeel; May 15, 1930, p. 292, by P. Thomas.

A report on a photo-elastic study of the Vierendeel truss appears in the *Bulletin* Technique de l'Union des Ingénieurs Sortis des Ecoles Spéciales de Louvain, Vol. 56, July 1, 1929, pp. 47-59.

RAYMOND D. MINDLIN

Oct. 28, 1931

NEWS OF THE WEEK

Board Recommends Steel Plate Lining in Hoover Dam Tunnel

STEEL lining for the Hoover Dam pressure tunnels is recommended in a report made by the Colorado River Board to the secretary of the interior. "Concrete lining is inadequate for this purpose at the pressures involved," the board reports. "Steel plate should be used as a container of the water in the pressure tunnels below the reservoir."

The board recommends further study to determine the best type of curves in the spillway tunnels. Each of the spillways has a discharge capacity of 200,000 sec.-ft., which involves a velocity in the tunnels approaching 180 ft. per second. Under such conditions the safety of the tunnels will depend on the integrity of the lining, the board says, "especially in its competence to withstand the errosive and plucking action of water at the high velocities involved, velocities approximately double previous engineering experience."

The board emphasizes the necessity of securing the best possible quality of concrete. The major objective, the report says, should be to secure essentially a monolithic condition which calls for thorough grouting of voids over the arch of the tunnel and seams in the surrounding rock.

The report is signed by Major Gen. William L. Sibert, chairman; Charles P. Burkey, Daniel W. Mead, Warren J. Mead and Robert Ridgway.

Cleveland Drops Manager System

By a vote of 61,267 to 51,970, the city of Cleveland, Ohio, on Nov. 3 discarded the city manager system of government, in effect since 1921, in favor of the former system calling for a mayor and councilmen elected from individual wards. Daniel E. Morgan, city manager, has resigned and Harold H. Burton, law director, will serve as acting mayor until a successor is elected in February, 1932. Because of a provision in the Ohio Constitution requiring the election of mayors in an even-numbered year, it is possible that the February election will be enjoined.

On the same date a proposal to install a city manager at Toledo, Ohio, was defeated, while the city of Utica, N. Y., adopted this form of government.

Salt Lake Speeds Relief Work

Unemployment relief in Salt Lake City through construction of needed public works was speeded up Nov. 3, when contracts were awarded on a storm sewer, bonds for which were voted on favorably Oct. 27. Such a record for getting a major project ($600,000) into action is believed to be unprecedented. Plans were drawn and bids asked before the bonds were authorized. The immediate work assures jobs for 5,000 unemployed. Rotation of jobs and continuation of the work throughout the winter are contemplated. The new sewer will relieve areas in the lower portions of the city which are badly flooded every year.

KILL VAN KULL BRIDGE AT NEW YORK OPENS TO TRAFFIC NOV. 15

Completion of the 1,675-ft. span steel-arch bridge over the Kill van Kull between Port Richmond, Staten Island, and Bayonne, N. J., will be celebrated on Nov. 14, and the bridge opened to traffic the following morning. The "Bayonne Bridge," as it has been officially named, is the largest steel-arch bridge yet built, and both its design and erection included elements of interest that were fully treated in *Engineering News-Record*, Dec. 13, 1928, p. 873, and Oct. 23, 1930, p. 640. The bridge was designed by the engineering staff of the Port of New York Authority and was erected by the American Bridge Co.

New York Engineers Hold Mass Meeting On Unemployment

AT A MASS meeting of members of the New York local sections of the major engineering societies on Nov. 9, the Professional Engineers Committee on Unemployment reported its work of organizing for employment and relief work among engineers. The committee asked the aid of all members in finding work for men out of employment and funds with which to pay them.

Enthusiasm seldom found in gatherings in the societies' auditorium marked the meeting. Nearly a thousand were present. Following the report and explanatory addresses there was lively discussion. H. deB. Parsons, chairman of the engineers' committee, and J. P. H. Perry, chairman of the executive committee, presided.

Unemployment Conditions Reviewed

General unemployment conditions were reviewed by the chairman. Harvey N. Davis, president of Stevens Institute and a member of the relief work committee, made general conditions specific by citing actual cases in which engineers out of work were found to be losing their morale. Some have been out of work for more than two years, for unemployment began to be felt in New York in the middle of 1929. In Chicago it did not develop until the following February and in San Francisco even six months later, according to statistics compiled by the engineering societies. Conditions in New York have been acute since midsummer.

E. P. Goodrich and J. P. H. Perry outlined the unemployment relief committee organization and some of the plans for developing work for engineers. John L. Leighton, of the city's emergency relief committee, told of their work and of how the engineers' work could be coordinated with it. Subsequently Mr. Matthews, chairman of the emergency work committee of the same organization, gave fuller details of its work and paid high compliment to engineers for their help in the past in making it more efficient.

Societies' Representatives Indorse Movement

Representatives of the four engineering societies, Francis Lee Stuart, Roy V. Wright, R. E. Tally and O. H. Caldwell, all added their indorsement to the movement, and Willard T. Chevalier, publishing director of *Engineering News-Record*, summed up the problem and stressed its direct bearing on every engineer in the metropolitan district.

General discussion brought out among other things the possibility of providing stimulating if not highly remunerative

work for unemployed men in research for technical societies and other non-profit organizations, and of making arrangements to allow unemployed men not in direct need to improve their time through attendance at regular lecture courses in local universities and colleges.

Collection of money has been begun; it will be speeded up next week by a general call to all employed engineers to contribute a definite share of their income each month for the next five months. All of the money that is contributed is to be applied to relief work, the committee expenses being separately underwritten.

Hoover Dam Notes

Rough grading of the streets of Boulder City is 84 per cent complete. Curb and gutter work is 10 per cent complete. Nearly 80 per cent of the water lines have been laid. Protection to all constructed buildings is afforded by 52 fire plugs in place. Construction of the presedimentation tank is complete. The sewer lines are 82 per cent complete, while one-third of the work has been done on the 4-in. service lines.

Tunnel progress to Oct. 30 is as follows: Tunnel No. 1 (outer Nevada), 1,307 ft. of pioneer headings; tunnel No. 2 (inner Nevada), 3,383 ft. of pioneer headings, 149 ft. of 38x56-ft. enlarged heading at lower portal; tunnel No. 3 (inner Arizona), 3,525 ft. of pioneer headings, 200 ft. enlarged heading; tunnel No. 4 (outer Arizona), 1,698 ft. of pioneer headings, 362 ft. of large heading at lower portal driven without aid of pioneer heading.

Prequalification Held Illegal for Mount Vernon School

A restraining order preventing the board of education of Mount Vernon, N. Y., from prequalifying contractors on the construction of an $800,000 addition to Washington school was granted by Supreme Court Justice Witschief on Nov. 6. Justice Witschief found no authority in the New York education law for prequalification and further found that Mount Vernon has no ordinance permitting the practice. The decision stated that prequalification prevented free competition and left "the door wide open to possible favoritism."

Twenty intending bidders on the project were asked to fill out qualification blanks. In the opinion of the private architect engaged by the school board, backed by the building committee of the board, eleven of these bidders failed to qualify and were refused plans for bidding. Three of the rejected contractors, the J. Weinstein Building Corp., the D. M. W. Contracting Co. and Lustig & Weil, all of New York City, filed a protest. The board of education withheld opening of any bids pending the decision. At this writing the corporation counsel of the city and the school board are undecided as to appealing the decision or as to further action. An abstract of the decision will appear in next week's issue.

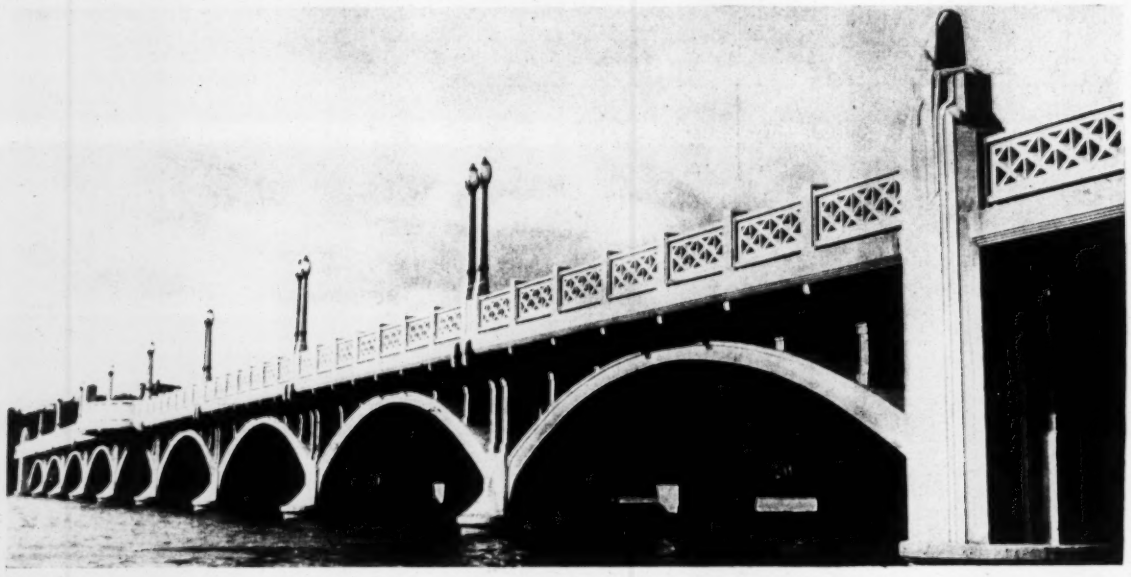
Fear has been expressed that the decision may have some bearing on the practice of prequalification by Westchester County officials on county work. It was used in the awarding of the county's new office building, now nearing completion at White Plains. However, the county plan of prequalification provides for an appeal to the county board of supervisors, and in the event an appeal is requested, the board examines the qualifications of all bidders, including those accepted by the awarding officer. No provision for an appeal was made in the Mount Vernon case.

Dynamited Sections of Owens River Aqueduct Repaired

Repairs to sections of the Owens River aqueduct at Los Angeles, dynamited by unidentified persons early Nov. 2 (*ENR*, Nov. 5, p. 744), were completed Nov. 5 and flow of water to the city reservoirs was resumed. Investigation by the Los Angeles department of water and power, city police and Los Angeles and Kern county authorities proceeded without an arrest (to Nov. 6), although several suspected persons, including a so-called labor agitator and a former employee of the department, were being sought.

Contract Let for Part of Cleveland's Sewage Plant

Contract has been awarded to the American Construction Co., of Cleveland, for the construction of reinforced-concrete aeration and sludge-settling tanks for the Easterly sewage-treatment plant, part of the $12,000,000 projected works for the city of Cleveland. The American company's bid was $2,736,874, the lowest of three bidders and several hundred thousand dollars lower than the estimate. The apparatus for the collection of sludge will be of the revolving type.



AURORA, ILL., OPENS MEMORIAL BRIDGE

Armistice Day, Nov. 11, was celebrated at Aurora, Ill., by the opening of the new concrete arch bridge over the Fox River at New York St. Statuary and architectural treatment supplement the engineering design to make this a war memorial structure. Ten 66-ft. arch spans are flanked by a girder span at each end. Designs were worked out under the cooperation of Walter E. Deuchler, city engineer; the Engineering Service Co., and Emory P. Seidel, sculptor. The John Ward Co. was the contractor. The cost of the bridge was about $300,000.

Commission Appointed to Formulate Illinois Road Program

Gov. Emmerson, of Illinois, has appointed five non-legislative members of the special commission authorized by the Illinois general assembly to formulate a supplementary road program for the state. The commission will report at the next regular session of the legislature. The members appointed by the governor are: H. L. Kellogg, chairman, good roads committee, Chicago Chamber of Commerce; Robert Kingery, manager, Chicago Regional Planning Association; J. Paul Clayton, president, Illinois Chamber of Commerce; George B. Anderson, Williamson County superintendent of highways; A. G. Gauen, chairman Madison County Regional Planning Association. Five senators and five representatives complete the commission.

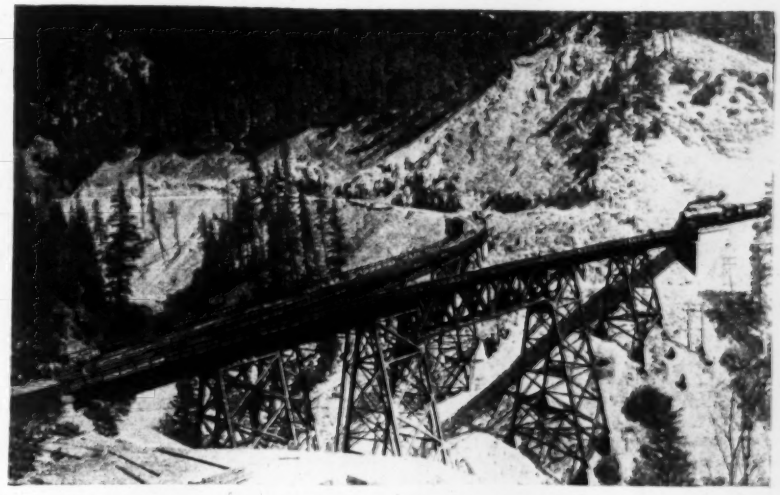
New York State Turned Down on St. Lawrence Treaty Proposal

New York State's proposals on questions at issue between it and the federal government over the proposed treaty for the development of the international section of the St. Lawrence River have been rejected by the department of state. The department, according to Secretary Stimson, deems it "unnecessary and indeed unwise to attempt to arrive at any agreement or definite adjustment in respect to the claims of the State of New York until at least substantial progress has been made toward the conclusion of a treaty between the United States and Canada." This statement was made in a letter to Frank P. Walsh, chairman of the New York State Power Authority.

New York State's claim that it has paramount right to control the power developed within its borders along the river also is denied by the federal government. On this point Secretary Stimson said: "Whatever the rights of the State of New York may be in respect to any electric power developed by the navigation project on the river along the international boundary, utilization of that electric power must in the end depend upon the authority and permission of the federal government."

All Bids Rejected on La Fruta Dam Rehabilitation

The bids received by the mayor and city council of Corpus Christi, Tex., on Oct. 29 for the rehabilitation of La Fruta dam based on the contractor's taking 5½ per cent gas plant revenue bonds at par in payment for the work were not satisfactory, and all bids, both on the general contract and on the mechanical flow control equipment, were returned to the bidders. The city will take immediate steps to borrow sufficient money to award a contract and should it succeed in so doing, bids will be asked for on a strictly cash basis.



NEW RAILWAY LINE OPENED ON PACIFIC COAST

Repeating the time-honored custom of driving a gold spike to signalize the completion of a new railway line, Arthur Curtiss James, on Nov. 10, at Bieber, Calif., formally opened the new 200-mile connection between the Great Northern and Western Pacific Railways which extends from Klamath Falls on the Great Northern in Oregon to Keddie on the Western Pacific in California. The photograph here reproduced is of the connection at Keddie. The new line will give the Great Northern an entry into San Francisco and adds a new line from San Francisco to Portland roughly parallel to the Southern Pacific. The line will be opened for freight at once, but passenger traffic will not be started until spring, as ballasting and surfacing are not yet completed and line and grade improvements are in progress on the Great Northern line north of Klamath Falls.

Del Rio & Northern Ry. Seeks to Construct New Line

Permission to construct a line to serve the water district of Maverick County, Tex., is sought by the Del Rio & Northern Ry. in an application filed with the Interstate Commerce Commission. The line would extend from Del Rio, Val Verde County, to Sonora, Sutton County, and from Del Rio to Quemado, Maverick County, 132 miles. No estimate of construction cost was furnished. The project would be financed by bonds offered for public sale. The road would furnish Del Rio with a shorter line to Corpus Christi by way of the proposed Winter Garden Belt and Missouri Pacific.

Texas Health Officials Suggest Sanitary Projects for Unemployed

To add useful facilities which have sanitary significance the Texas state board of health in sending out questionnaires relative to unemployment relief gives the following sanitary items in a list of useful work that may be undertaken for the unemployed instead of installing soup kitchens and other dole practices:

(1) Sanitation of streets by filling in ditches, (2) extension of water mains and sewers, (3) cleaning up the buildings and grounds of the water plant, sewage plant, parks, playgrounds, school grounds, incinerators and other city owned properties, (4) installation of community sanitary toilets, (5) establishment and operation of a community garden or truck patch (successfully carried out in Beaumont, Tex.), (6) tree planting and forestry work throughout the city, (7) salvage and disposition of old automobiles and other sources of nuisances that can be turned into profit if the labor in salvaging them is properly supervised, (8) repair and sanitation of public buildings and equipment, (9) development of parks and playgrounds.

Conference on Home Building and Home Ownership

President Hoover's Conference on Home Building and Home Ownership will be held in Washington, D. C., Dec. 2-5. At this conference reports covering various technical and engineering phases of house construction and equipment will be discussed. These reports will take up present practice in the home-building field as well as future developments and investigations. Future developments that may reduce home building costs will be taken up by the committee on technological developments of the conference.

American Concrete Institute Nominates New Officers

The nominating committee of the American Concrete Institute reports the following nominations for offices to become vacant at the next convention in Washington, March 1-4: president, S. C. Hollister; vice-president, Arthur R. Lord; treasurer, Harvey Whipple.

Floods and Slides Hold Up Panama Canal Traffic

Traffic through the Panama Canal has been delayed, first by emergency measures to meet expected flood conditions due to unusual rains and then by a landslide in Gaillard cut. As soon as the gaging stations on the Chagres River reported abnormal floodflows coming down into Gatun Lake, traffic through the canal was stopped in order to use the lock culverts to supplement the spillway in lowering the lake level. This was done on Nov. 7. On Nov. 9 Gov. Burgess reported to the war department that the flood developed to about the intensity of the flood of 1923 and that traffic had been resumed that morning but was soon blocked by the slide in the cut.

New Toll Bridges Opened by Kentucky and West Virginia

During August of this year two states were added to the list of states and cities operating toll bridges the construction of which has been financed through the sale of toll revenue bonds. The new Ohio River toll bridge at Ashland, Ky., is the first structure to be completed in an extensive program of toll-bridge construction which that state has under way. It is a cantilever bridge with a channel span 739 ft. long and 431-ft. anchor spans. According to Wilson T. Ballard, vice-president, J. E. Greiner Co., Baltimore, the use of long anchor spans results in an economical layout by eliminating the need for heavy anchor piers. The piers used were comparatively light, since they were required to resist no uplift. The bridge provides a 22-ft. roadway and a single 5-ft. sidewalk. Silicon steel was used in the trusses and carbon steel for the floor system and bracing. Kentucky's toll bridge program is being carried out by the state highway department.

On Aug. 12 the West Virginia bridge commission (distinct from the state highway commission) opened a new structure across the mouth of the Great Kanawha River, connecting Point Pleasant with Henderson and forming a link in the highway along the Ohio River between Huntington and Parkersburg. This structure marks the initial step in the commission's program to build a number of toll bridges and to acquire existing toll bridges throughout the state. The new bridge, also of cantilever type, has a main span of 600 ft. and anchor spans of 291 ft. A 20-ft. roadway and a single 5-ft. sidewalk are provided. Structural-grade carbon steel is used throughout. The approaches to this bridge consist of viaducts made up of rolled-beam spans on reinforced-concrete rigid-frame bents. In the accompanying view of this bridge, the heat-treated eybar suspension bridge between Point Pleasant, W. Va., and Gallipolis, Ohio (*ENR*, June 20, 1929), is shown in the background. This bridge, as well as the two newly opened cantilevers, was designed and built under the supervision of the J. E. Greiner Co., Baltimore, Md.

Engineering Career of A. J. Wiley (1862-1931)

A. J. Wiley was born in New Castle County, Del., on July 15, 1862. His death on Oct. 8, 1931 (see *ENR*, Oct. 15, p. 629), terminated an engineering career of half a century's duration.

After his graduation from Delaware College in 1882, Mr. Wiley spent a year on surveys and construction for the Baltimore & Ohio R.R. in Delaware and Maryland. His first assignment on irrigation work and the connection that established him in the West extended from 1883 to 1886, when he served as rodman and assistant engineer with the Idaho Mining & Irrigation Co., of Boise, Idaho. Then after two years on construction for the Union Pacific R.R. at Butte, Mont., he returned to the Idaho company in 1888 as chief assistant engineer. From 1892 to 1898 he was chief engineer and manager of the Owyhee Land & Irrigation Co., constructing a large irrigation project near Grandview, Idaho. He was also connected with the construction of the New York Canal, one of the early developments in Boise Valley. During 30 years following Mr. Wiley was active on great irrigation and power projects throughout Idaho, Oregon, California and other states in the West, including many large dams, among others Swan Falls, Horseshoe Bend, Granite Springs Dam, Twin Falls North Side, Shoshone Falls, American Falls, Don Pedro Dam and Exchequer Dam.

He served as consulting engineer to the U. S. Reclamation Service from the inception of its work in 1902, advising on all of its large dams. Since 1925 he was also consulting engineer for the interior department. The officials of the Reclamation Service and his associates among the engineers of the service had implicit confidence in his engineering judgment and felt a genuine sense of security when his approval of a project had been given.

He was consulted in connection with the design and construction of many other features of government irrigation and power projects, particularly main canals and important canal structures. He was the first engineer selected for the Hoover Dam consulting board.

Mr. Wiley's extensive experience in the design of dams and power plants was also recognized and utilized by other departments of the government and by foreign clients. He was consulting engineer for the U. S. Indian Service on the design and construction of the Coolidge Dam in Arizona. The Panama Canal Zone selected him as one of the consultants on the design of the Madden Dam, the contract for which has only recently been awarded. He was consulted by the British government in 1927 in the preliminary investigation of about 30 dam sites in India. Three times Mr. Wiley visited Porto Rico in connection with dam projects.

When stricken, Mr. Wiley was engaged on work in San Gabriel Canyon, California, where the Los Angeles Flood Control District is planning several flood-control dams. He was also in California for conferences in connection with the great aqueduct which will carry Colorado River water to Los Angeles and the surrounding district.

Mr. Wiley's death ends an exceptionally brilliant engineering career. It deprives the government and many large organizations throughout the world of a consultant who was highly valued. He held the respect and highest regard of all who knew him. During his 50 years in the West he made a host of intimate friendships, especially among the engineer associates and others who were connected with his many successful and monumental engineering projects.

JOHN L. SAVAGE.

New toll bridge at Point Pleasant, W. Va.

New Ohio River toll bridge at Ashland, Ky.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Cannot Compel Contractors to Rotate Work on Public Buildings, Comptroller General McCarl Rules

DESPITE the worthiness of suggestions for rotating the hours of work on public buildings to provide more widespread employment, the comptroller general has informed the secretary of the treasury that it would be illegal to require contractors to carry out such a policy. The law stipulates that money be used only for the purposes designated, Mr. McCarl points out.

While the conclusions of the comptroller general will prevent insertion of a clause in public contracts requiring contractors to stagger working hours to provide for two or three shifts on the same job, it will not prevent a contractor from doing this voluntarily.

Consolidation of Government Engineering Activities

Although legislation for departmental reorganization will again be brought up when Congress convenes, its sponsors do not believe that the more controversial features such as the consolidation of the engineering activities of the government can be taken up at this time. It is realized, however, that the need for economy may overcome objections to the consideration of controversial legislation in a Congress so evenly divided politically as the next one will be. As the deficit continues to grow increasing interest is being given to proposals for reducing governmental expenditures. It is generally conceded that a more intelligent grouping of the various bureaus and branches of the government would promote efficiency and economy.

It is the intention of Representative Williamson, of South Dakota, chairman of the committee in charge of the reorganization program, to introduce a bill consolidating the army and the navy into a department of defence. The civil engineering activities of the army engineers would be directed by a consolidated bureau of army and navy engineers until all the engineering functions of the government can be unified under one bureau.

Even though it may be impossible to bring about major consolidation at this time, Mr. Williamson believes that discussion of the subject will be helpful in that a comprehensive study by the committee will show department heads many ways to eliminate duplication of activity without changes in organization.

All-American Canal Contract Ready for Signing

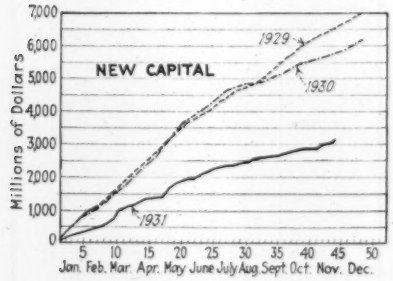
Secretary of the Interior Wilbur has approved the form of the contract covering repayment to the government by the Imperial Irrigation District of the cost of the All-American canal. Execution of the contract awaits only the vote of the district on the terms as agreed upon, including some specified additional public lands. Objections presented by the Palo Verde irrigation district at a hearing Oct. 22 *(ENR*, Oct. 29, p. 705), have been overruled by Secretary Wilbur.

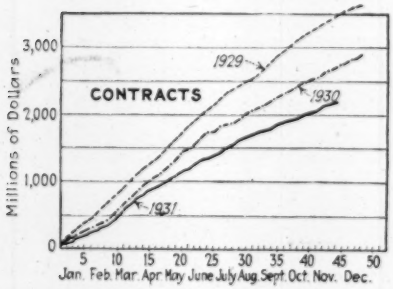
Capital and Contracts

New capital issued in the week ended Nov. 7 totaled $8,000,000 — public, $6,000,000 and private, $2,000,000. The October weekly average was $19,000,000 and that for November, 1930, $73,000,000.

The principal bond flotations of the week were: State of Missouri 4s, $5,000,000; roads; Chicago District Electric Generating Corp. 6s, $2,250,000, plant expansion.

Cumulatively, the total for the period Jan. 1 to Nov. 7, inclusive, is $3,134,000,000, compared with $5,585,000,000 in the corresponding period of 1930.





COSTS AND CONTRACTS

ENR Index Numbers

Cost			Volume		
Nov. 1,	**1931**	**169.28**	**Oct.,**	**1931**	**229**
Oct. 1,	1931	169.78	Sept.,	1931	225
Nov. 1,	1930	198.54	Oct.,	1930	211
Average,	1930	202.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913	.....	100.00	1913	.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Nov. 12, with some comparisons, total as follows:

(In Thousands of Dollars)

	Nov. 12, 1931	Average of Last Four Weeks 1931	Average of Last Four Weeks 1930
Buildings:			
Industrial	$1,291	$1,751	$6,125
Other	14,394	23,830	25,852
Streets and roads.	4,031	4,439	7,660
Other construction.	17,420	11,245	14,346
Total	$37,136	$41,267	$53,984
Total, all classes, Jan. 1 to Nov. 12:			
1931			$2,248,246
1930			2,923,097

Brief News

FORMATION of a committee to protect the interests of holders of Detroit & Canada Tunnel Co. twenty-year 6½ per cent debentures has been announced, the company having reported to the trustee that it is unable to meet the interest due on the issue on Nov. 1.

CAPITAL EXPENDITURES on highways during 1930 by Canadian provinces were $70,000,000, according to data prepared by the dominion bureau of statistics. During the same period $23,100,000 was spent on maintenance of primary and secondary highways.

CONSTRUCTION of the Wellington St. tunnel under the Lachine Canal in Ottawa has been resumed following agreement between the contractors and the city that the city assume the $600,000 extra cost because of changes in the plans and that the $400,000 extra cost because of the nature of the soil be left to the courts to adjudicate.

ROAD CONTRACTORS in Louisiana have been notified that the state highway commission will issue certificates of indebtedness on balances due on estimates until the commission has sufficient money to pay the complete amount. The certificates will bear 5 per cent interest and will mature March 1, 1932. Harry B. Henderlite, state highway engineer, explains that postponement of a $5,000,000 bond sale made the deferred payment plan necessary.

FIFTEEN BIDS were submitted on Nov. 5 for the construction of a new lift bridge at the South Michigan Ave. crossing of the Buffalo River at Buffalo. The low bid, $509,509, by the Wisconsin Bridge & Iron Co., was more than $40,000 below the estimate submitted by the engineers. The bridge will be 100 ft. long and will have a clearance of 17½ ft. above the river.

NO BIDS were received on Nov. 3 for two issues of Minnesota highway bonds. One issue was for $675,000 4½s due in 1939, to be used to reimburse Hennepin County for funds spent on state highways, and the other was for $725,000 4½s due in 1947 and 1948 to be placed in the state trunk highway fund.

RECOMMENDATION is made in the annual report of the Virginia state highway commission that the convict road force of about 2,000 men be reduced to 1,500 on the ground that "at the present prices at which contractors are bidding on construction work there is but little economy in using such a large force so far as the state highway commission is concerned."

TWO DORMITORIES for the Tennessee Agricultural and Industrial Normal School, at Nashville, one for men and one for women, to cost $160,000 each, will be built soon, the contract having been awarded to the Angle-Blackford Co., Greensboro, N. C. The buildings will be of reinforced concrete and brick.

Concrete Pavement Yardage

There is given below a tabulation of concrete pavement yardage awarded in the United States during the month of October, divided according to roads, streets and alleys, and the totals for the ten months' period ended Oct. 31:

	During October	To Oct. 31
Roads	2,482,405	104,079,287
Streets	1,454,713	19,932,065
Alleys	71,839	752,090
Total	4,008,957	124,763,442

New German Zeppelin to Surpass the "Akron" in Size

The new Zeppelin under construction at Friedrichshafen, Germany, for use on the transatlantic route, will be constructed entirely of duralumin and will have a volume of 201,000 cu.m., nearly 10 per cent more than the "Akron," recently accepted by the United States navy. The Zeppelin will have a cruising speed of 80 miles per hour and a loading capacity of 88 tons, as compared with 76 miles per hour and 82½ tons loading capacity for the "Akron." The Zeppelin will be 247.8 m. long and 41.2 m. wide. It is expected that the new ship will be ready for trial voyages next year.

Personal Notes

HUNTER MCDONALD, of Nashville, Tenn., chief engineer of the Nashville, Chattanooga & St. Louis R.R., retired on Nov. 1. He had been with the railroad for 52 years, for 39 of which he had been chief engineer. He will be succeeded by GEORGE F. BLACKIE, who has seen 45 years' service with the railroad.

EDWARD M. SHAFTER has been appointed city manager of Royal Oak, Mich., to fill the vacancy caused by the resignation of R. J. Whitney, who has become city manager of Mamaroneck, N. Y. Mr. Shafter was formerly city engineer of Royal Oak and recently has been acting as city manager.

C. E. BOESCH, of Durham, N. C., has been assigned to the Memphis U. S. Engineer District staff, as assistant to Major E. C. Kelton. Mr. Boesch was in the U. S. Engineer Office in Memphis from 1905 to 1907 and in 1907-08 was assistant engineer of the Memphis water department. Later he was designing engineer in the city engineer's office of Chicago. Since 1912 he has been a member of the Gilbert C. White Co., consulting engineers.

CHESTER E. ALBRIGHT announces the dissolution of the partnership of Albright & Mebus, of Philadelphia, Pa., and the organization of Albright & Friel, Inc., consulting engineers, with Mr. Albright as president and Francis S. Friel as vice-president and treasurer. The new corporation will practice general consulting engineering, specializing in municipal work, including water supply and sewage disposal.

AUGUST V. GRAF, formerly chief chemical engineer at the Chain of Rocks plant of the St. Louis waterworks, is now in charge of the Howard Bend plant and has general supervision of the Chain of Rocks plant and all purification.

Obituary

OLIN H. LANDRETH, professor emeritus of engineering at Union College, Schenectady, N. Y., died at his home in Mount Vernon, N. Y., on Nov. 5. Dr. Landreth was graduated from Union College in 1876 and from 1876 to 1877 was instructor in the physical laboratory at that institution. From 1879 to 1886 he was professor of civil engineering and from 1886 to 1894 was dean of the engineering department of Vanderbilt University. He returned to his alma mater as professor of engineering in 1894 and was made professor emeritus in 1917. Dr. Landreth was noted throughout the country as a sanitation engineer and in the '80s made surveys and investigations for railroads, waterworks and electric light systems in many Southern cities. He was consulting engineer of the New York state board of health in 1896-1901, a member of the New York State Water Storage Commission in 1902-03, of the New York Bay Pollution Commission in 1903-05 and a member of the Metropolitan Sewerage Commission of New York in 1906 to 1908. Dr. Landreth was the author of many reports on sanitary, hydraulic and engineering topics on water pollution, water storage, floods and stream regulation. He was a past director of the American Society of Civil Engineers and a member of the American Institute of Consulting Engineers.

EUGENE W. STERN, of New York City, died on Nov. 9 as the result of a self-inflicted bullet wound. According to his family, he had been depressed because of financial reverses. Mr. Stern, who was 66 years old, was formerly chief engineer of highways for the Borough of Manhattan, New York City. In his practice as consulting engineer he specialized on foundations and building construction in steel, concrete and reinforced concrete and was retained on many large buildings in New York City and vicinity. Previous to his service with New York City he was chief engineer of the Structural Iron Works from 1891 to 1902. During the War Major Stern did notable work as chief road officer of Base Section No. 2 at Bordeaux, France. He also served with the 8th French Army in the Toul sector. Mr. Stern was a member of the American Society of Civil Engineers and the Engineering Institute of Canada. He was one of the organizers of the American Institute of Consulting Engineers and was its first secretary.

K. S. RISER, of Grand Rapids, Mich., was killed on Nov. 1 when the automobile in which he was riding was struck by a train at a crossing. Mr. Riser, who was 72 years old, was born in Oslo, Norway, and came to the United States 50 years ago. He specialized in steel and concrete buildings and bridges. He had been affiliated with the American Bridge Co., of Pittsburgh, and the Clinton Bridge Co., of Clinton, Iowa, but in recent years had been engaged as consultant.

GEORGE F. TOUPAIN, superintendent of maintenance of the Colorado highway department in District No. 2, died suddenly on Oct. 25 while sitting in his automobile near Gunnison, Colo. He was 60 years old.

E. FRANK GATES, of Delaware, Ohio, engineer for the Pure Oil Co. and former county surveyor of Washington County and city engineer of Marietta, died on Nov. 3 of a cerebral hemorrhage.

SOCIETY CALENDAR

AMERICAN ROAD BUILDERS' ASSOCIATION, Washington, D. C.; annual convention and road show, Detroit, Mich., Jan. 9-15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting Jan. 19-22, New York City.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Chicago; annual meeting, St. Louis, Jan. 26-29.

INTERNATIONAL ACETYLENE ASSOCIATION, New York City; annual meeting, Chicago, Nov. 11-13.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Chicago, Feb. 10-12.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual meeting, Pittsburgh, Jan. 27-29.

MISSOURI WATER AND SEWERAGE CONFERENCE at Jefferson City, Mo., Oct. 22-23, had an attendance of 82. Officers elected were: chairman, E. E. Wolfe, Hannibal; vice-chairman, W. E. Barnes, Liberty; secretary, Herbert Bosch, Jefferson City.

NORTH CAROLINA SECTION, American Water Works Association, and North Carolina Sewage Works Association, at the annual meeting in Greensboro, Nov. 2, elected officers as follows: president, William C. Olsen, Raleigh; vice-president, J. H. Lampley, Hendersonville; secretary, H. G. Baity, Chapel Hill.

NORTHWEST CHAPTER, American Society for Steel Treating, will hold a welding conference in Minneapolis, Nov. 19-21 in cooperation with the Manufacturers Association of Minneapolis, Inc. The conference will be wholly educational and it is hoped to have it appeal particularly to the actual workers in the field by emphasizing the practical aspects of the art of welding.

OHIO CONFERENCE ON WATER PURIFICATION held its eleventh annual session at Lorain Oct. 15-16 and elected officers as follows: chairman, W. I. Van Arnum, Youngstown; vice-chairman, Thomas H. Tristam, Lorain; secretary-treasurer, J. M. Montgomery, Piqua. Papers were read dealing with odor and taste prevention, changes in bacteriological methods, and reforestation. An inspection trip was made to Lorain, Avon Lake Village, Elyria and Sandusky water-treatment plants.

ROCKY MOUNTAIN SECTION, American Water Works Association, held its annual meeting in Denver Oct. 23-24. The Rocky Mountain waterworks college, University of Colorado extension course, operated in conjunction with the convention. G. C. Culberson, Raton, N. M., was elected chairman for the ensuing year. The other officers were reelected.

Construction Equipment and Materials

Large Rope-Testing Machine

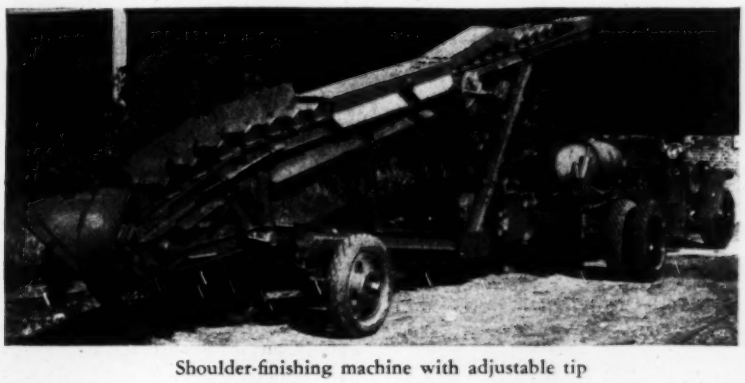
Rope specimens up to 3½ in. in diameter in 6-ft. lengths can be tested in a rope-testing machine recently delivered by W. T. Avery, Ltd., Birmingham, England, to the government of Ontario at Toronto. The machine is of the compound lever type with a capacity of 1,000,000 lb. Special hydraulic shock absorbers are fitted under the weighing platform to take up recoil, while an electrically controlled poise on the beam gives audible warning of any loss of equilibrium as the test proceeds. A special device makes a graphic record of the load and elongation of the specimen under test.

Shoulder-Finishing Unit Improved

Several refinements in the Whitcomb-Lehmer road shoulder-finishing machine, described in *ENR*, Jan. 1, 1931, p. 45, have been announced by the Whitcomb Locomotive Co., Rochelle, Ill. This unit is now mounted on a Hug truck which develops 100 hp. and has a low gear ratio, permitting a much slower operating speed, so that shoulder dirt can be handled in greater volume than before. As the truck is designed for right-hand drive, the operator has better visibility and more accurate control over the finishing work.

Improvements in the device itself consists principally of the development of an adjustable boom tip which permits variations for all ditch contours from 1½ : 1 to level without dismantling the original tip. Adjustment is by a rod on the upper boom member and a locking slide midway between the upper and lower members. The gap in the boom members which results from the varying positions is closed by a flat idler pulley on the lower boom member and an idler sprocket on the upper. A hydraulic hoist and turnbuckle member makes it possible to elevate or lower the main shoulder section of the machine to any desired position.

Machines of the old type can be equipped with the new boom tip at moderate cost.

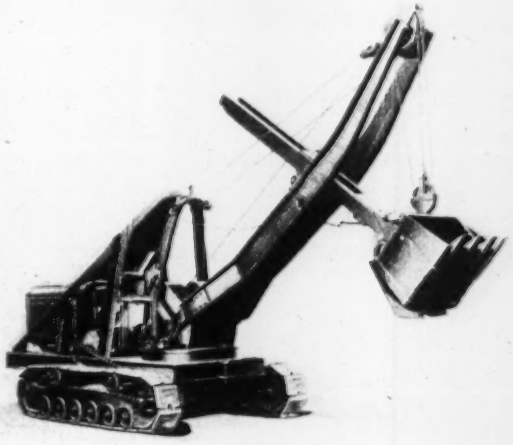


Shoulder-finishing machine with adjustable tip

Small Tractor Shovel

To meet the need of contractors for a small shovel built along sound engineering principles, the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill., has announced the Austin Badger, a three-quarter swing convertible excavator built around the McCormick - Deering industrial power unit. Construction features include cut gearing, inclosed and running in oil; ball or roller bearings at every moving point of consequence; a curved boom to give an unusually high bucket lift; and a special auxiliary wheel mounting for rapid transportation from job to job. The bucket, of 11-cu.ft. capacity, is made of steel plates reinforced by heavy steel bands welded into a solid unit. The main frame is made of heavy H-beams connected by channels at the ends, with two heavy H-beam axles underneath. The base casting for the turntable is a one-piece heat-treated steel casting solidly riveted to the main frame. The A-frame forming the support for the upper end of the mast is of similar welded construction, bolted to the main frame to make easy overhauling possible. The mast consists of two heavy channels and rises from both sides of the machinery table, thus bracing it and maintaining all parts in perfect alignment. Crawlers are 10 ft. 6 in. long and measure 7 ft. 8 in. from outside to outside. Clutches are all covered to protect them from weather and dirt and are operated by boosters. In addition to all regular controls, each shovel is fitted with a power-operated boom hoist as regular equipment.

Although this excavator can maintain a top speed of 4 m.p.h. when operated with crawlers, it is also provided with rubber-tired wheel equipment for long-distance transportation. Front and rear axles equipped with Timken roller bearings, and wheels carrying 10-in. solid cushion rubber tires can be attached in about ten minutes without the use of any extra tools or equipment.



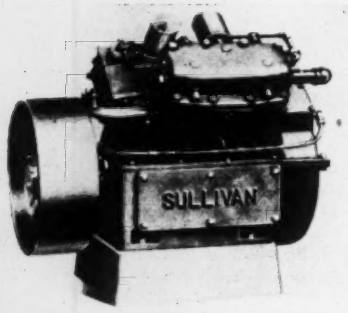
¾-swing tractor shovel

Besides the shovel equipment, this unit can be fitted with a clamshell, backfiller, ditcher, dragline or crane attachment.

Ball-Bearing Air Compressors

Additions to its line of vertical single-acting air compressors in new models and new capacity ranges have been announced by the Sullivan Machinery Co., Chicago, Ill. Models WL-1 (belt driven and V-belt driven) and WL-11 (direct motor driven) compressors are single-cylinder, single acting units, distinguished by the use of heavy-duty ball bearings on the crank-shaft. The cylinder is cast separate from the frame, and the head, containing inlet and discharge valves of the wafer type, may be attached in any one of four horizontal positions to secure convenience in piping connections. These units provide displacement ranges from 27 to 87 cu.ft. per minute, and for pressures up to 125 lb. per sq.in. Direct-connected units employ flexible external and internal gear couplings between the compressor flywheel and the motor shaft. Automatic regulation of several types is available.

Models WL-2 and WL-4 are belt-driven vertical units available in two- and four-cylinder models, respectively,



Four-cylinder V-type air compressor

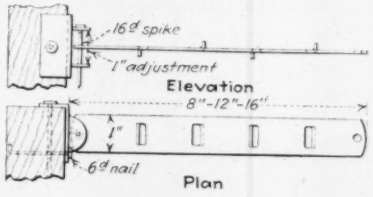
with capacities ranging from 119 to 348 cu.ft. of free air per minute. The four-cylinder units are of V design, the two pairs of cylinders being set at an angle of 90 deg. with a common crankshaft and only two cranks. These units may be driven by V-belts from any desirable form of power unit.

Waterproofing Agent for New or Old Concrete

Waterproofing or damp-proofing concrete walls which are leaking through cracks or porous spots is the major function of Stontite waterproofing, a new product of the Stonhard Co., 401 North Broad St., Philadelphia, Pa. This consists of a liquid which, when mixed with fresh, neat, standard portland cement, will set in from three to five minutes and seal off water without removing the pressure. The repair thus made is said to be permanent, and the relative ease and quickness with which leaks can be stopped assure a wide field of application for the new product.

Wood Buck Anchor for Masonry

Fastening door and window frames or other forms of timber to walls of concrete, brick or tile is the function of a wood buck anchor announced by the M & M Wire Clamp Co., Minneapolis, Minn. This is made in two parts: an anchor plate of either straight or angle section and a strap anchor with a length of 8, 12 or 16 in. Carpenters place the anchor plates and space them correctly for the mortar joints, variations being cared for by a 1-in. vertical adjustment. The strap is placed by the mason as the work progresses and is fastened to the anchor plate by simply dropping in place a 16-penny spike. Small projections on the strap anchor serve to bond it securely in the masonry, and a hole at either end saves the time of the mason, who does not need to choose which end to fasten to the anchor plate. The additional hole also makes it possible to extend the anchorage by the insertion of an extension wire.



Adjustable masonry anchor

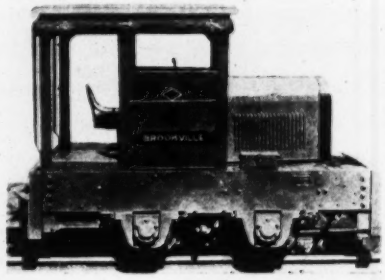
Protective Paint for Metals

Announcement has been made by the American District Steam Co., North Tonawanda, N. Y., of the perfection, after more than two years' experimenting and testing, of a protective paint for use on steam and hot water pipe lines. The product has been named Adsco Pipe-Kote 505. According to the manufacturer, it provides several important advantages over ordinary pipe paints in that it is impervious to any degree of heat generated by steam; is practically immune to the action of moisture, dilute acids and alkalis; and, while producing an extremely hard, tenacious coating, is sufficiently elastic to expand and contract with the pipe without cracking or peeling.

While Pipe-Kote is especially recommended for use on steam and hot water lines, it works with equal effectiveness on gas and water mains, stacks, boiler fronts, bridges and all other surfaces exposed to extreme or rapid changes of temperature and atmospheric conditions.

Truck Motor Drives Locomotives

Locomotives for any gage of track in 2-, 2½-, 3-, 3½- and 4-ton sizes comprise the series BFA, recently announced by the Brookville Locomotive Co., Brookville, Pa. An absolute guarantee against failure for any cause except accident or misuse is given on the chassis, running gear and all other parts of Brookville make. The power plant used is model AA of the Ford Motor Co., which can be inexpensively serviced by Ford dealers. Construction features of the new series include dual spring journal wheel suspension, steel tires, four-speed reverse gear giving a maximum of 16 m.p.h. in either direction, governor control, Timken bearings at wheel journals and in the reverse gearing, three-pocket link and pin coupler, self-starter and half-length steel cab fitted with roll curtains.



Light gasoline locomotive

New Publications

Steel Sheetpiling—A 94-p. leather covered data book on Carnegie steel sheetpiling has been issued by the CARNEGIE STEEL Co., Pittsburgh, Pa. This gives dimensions and weights and also a great deal of technical data on the uses of this product. Photographs of typical installations are included.

Floor and Roof Construction — The "Smooth Ceilings" system of reinforced concrete floor and roof construction for structural steel or reinforced concrete buildings is described in a 4-p. folder published by WALTER H. WHEELER, 1000 Metropolitan Life Building, Minneapolis, Minn.

Pipe Tools—Condensed catalog 32 has been published by THE BORDEN Co., Warren, Ohio, to simplify the selection of the exact tools needed for a given job without hunting through a large catalog. It covers pipe machines, stocks and dies, pipe cutters and accessories.

Industrial Cars—Brief descriptions of many varieties of industrial railway rolling stock are given in Bulletin 102 of the AMERICAN CAR & FOUNDRY Co., 30 Church St., New York City.

Welding—LINCOLN ELECTRIC Co., Cleveland, Ohio, has issued plate 28 in its series of studies in structural arc welding. This covers the use of bar frames in arc-welded mill buildings.

Wood Moldings—A revised series of standard wood moldings has been issued by the central committee on lumber standards of the NATIONAL LUMBER MFRS. ASSN., 713 Transportation Building, Washington, D. C. This book contains 250 patterns, each with serial designation; 81 typical assemblies; a cross index from the revised to the old series, and an extended index to various types of moldings.

Portable Bituminous Plant—A 4-p. circular 20 of the CHAUSSE OIL BURNER Co., 1227 West Beardsley Ave.; Elkhart, Ind., describes a portable bituminous premixing plant for the construction of low-cost black top asphalt surfaces placed directly on gravel, worn hard pavement or other suitable foundation. This machine, a complete portable asphalt plant with a daily capacity of 200 to 250 tons, is built in two units for easy moving.

Concrete Admixture—BARNSDALL TRIPOLI Co., 2111 Railway Exchange Building, St. Louis, Mo., has issued bulletin E describing the use of Barnsdall admix as an integral waterproofing for concrete, mortar, stucco and cement products.

Rust-Resistant Iron—"The Path to Permanence," a 64-p. booklet published by the REPUBLIC STEEL CORP., Youngstown, Ohio, gives much information on Toncan copper molybdenum iron sheets. It illustrates various types of installations of this product as well as several examples of performance under unusually severe conditions.

Short-Center Drives—Charts, tables and engineering data on 5,000 standard Vim short-center drives ranging from 5 to 100 hp. are given in a new 148-p. booklet published by E. F. HOUGHTON & Co., Philadelphia, Pa.

Steel Tanks—Water storage for municipal waterworks, private water systems, industrial plants, institutions and railways by means of elevated tanks and standpipes is thoroughly discussed in a 28-p. illustrated booklet issued by the PITTSBURGH-DES MOINES STEEL Co., 3450 Neville Island, Pittsburgh, Pa. Engineering data in the form of tables and charts are included.

Portable Tool Box—The HanDeeBox, an all-steel tool box divided into compartments and mounted on roller bearing wheels for easy towing, is described in a recent bulletin G-6, issued by Littelford Bros, Ohio. Other types of tool boxes, a sectional storage house, lead furnaces, asphalt kettles and trailers are also described.

Iron Culverts—How the alloying of copper and molybdenum to Toncan pure iron has provided rust-resisting qualities is told in the Toncan culvert handbook, a 56-p. publication containing data pertaining to the use of this type of culvert for highways, storm sewers, railways and drainage. Copies can be secured from the TONCAN CULVERT MFRS. ASSN., Massillon, Ohio.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Sewers			
Cleveland	Sewage treatment plant	$2,736,874	Contract
Bridges			
Massachusetts	Bridges	1,000,000	Proposed
Streets and Roads			
Georgia	Roads and bridges	1,300,000	Bids asked
Power and Lighting			
Evanston (Ill.)	Street lighting system	1,438,000	Bids asked
Wichita (Kan.)	Natural gas system	1,000,000	Bids asked
Unclassified			
New York	Telephone impvts	3,817,920	Proposed
Federal Government			
Montgomery (Ala.)	Post office	1,000,000	Bids asked
Biloxi (Miss.)	Soldiers Home	1,000,000	Bids asked
San Antonio	Quarters, etc	6,000,000	Proposed
Factories and Mills			
Hammond (Ind.)	Factory	1,000,000	Proposed
Buildings			
Baltimore	Residential development	4,000,000	Separate contracts
Boston	Office	1,500,000	Bids asked
Springfield (Mass.)	Office and garages	1,000,000	Proposed
Brooklyn	Nurses training school	1,625,000	Proposed
Cleveland	Exhibition hall	1,500,000	Contract
Pittsburg	Apartment	1,000,000	Bids asked
Pittsburg	Hospital	2,000,000	Bids asked

WATERWORKS

PROPOSED WORK

Calif., Modesto — City Council and Modesto Irrigation Dist., surveys replacing 1 mi. portion Lateral 4 with underground conduit pipe, $155,000. F. J. Rossi, city engr. Noted Oct. 8.

Fla., St. Petersburg—City, Engineers of Public Utilities Dept., preparing estimates, extending water and gas mains to new soldier's home to be built on outskirts city. $30,000.

Ill., Wilmette—Village Water Bd., new Lake Michigan water supply, incl. intake pumping station, 6 m.g.d. filter plant, $600,000. Pearse, Greeley & Hansen, Tower Bldg., Chicago, engrs. Noted Sept. 10.

Ia., Vinton—Rejected bids Oct. 21, well and pump, $13,000, water tank of 70,000 gal. capacity. W. E. Gilchrist, city clk.

Mass., Scituate—Town, Bd. Selectmen, water plant extensions, $125,000.

Mont., Deer Lodge—Water Supply, $15,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

N. Y., Hawthorne—Soon takes bids reservoir, pumping station, water lines, $250,000. C. H. Sells, Inc., Pleasantville, engrs.

O., Delaware — Waterworks. To exceed $15,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Pa., Chambersburg—Boro impounding earth, concrete dam. Election soon, $250,000, for same. F. D. Rhoads, Jr., Chambersburg, engr.

Texas—See "Power Plants."

Tex., Corpus Christi—Bids for rehabilitation of La Fruta Dam on Lake Lovenskiold, based on contractors taking gas plant revenue bonds at par in payment not satisfactory. All bids returned to bidders. City will take steps to borrow sufficient money to award contract and if successful new bids will be asked on cash basis. R. J. Cummins & H. E. Elrod, 1105 Nixon Bldg., Corpus Chrisi, and 727 Bankers Mortgage Bldg., Houston, consult. engrs. L. C. Hill, 605 West 10th St., Los Angeles, Calif., consult. engr. Noted Oct. 15, under "Bids Asked."

Que., Quebec—City, second waterworks pipe, $200,000. E. Hamel, Quebec, city engr.

Ont., Barrie—Town, Water & Light Comn., replacing 4,800 lin.ft. 4 in. mains with 8 in. c.i. mains, additional 6 and 8 in. c.i. mains, hydrants, connections. $25,000. J. A. Hare, Barrie, engr.

Ont., Carleton Place—Town Council soon takes bids extending waterworks. Est. $25,000.

Ont., New Hamburg—F. W. Thorold & Co., 122 Rose Park Dr., Toronto, preparing plans new waterworks system, incl. deep well system, storage and distribution, for City $125,000. Drilling deep well, to Layne Canadian Water Supply Co., Metropolitan Bldg., Toronto. Noted Sept. 24.

Ont., Oshawa—Soon takes bids brick, concrete filtration plant for waterworks, incl. filtration equipment, valves, piping, pumps, $85,000. F. B. Goedike, City Hall, engr. F. A. Dallyn, 71 King St. W., Toronto, consult. engr.

Ont., Port Arthur—Waterworks extensions, incl. 6 in. c.i. mains, valves, hydrants, connections. $25,000. J. A. Antonisen, City Hall, engr.

Ont., Toronto—North York Twp. watermain extensions, incl. 6 in. c.i. mains, valves, hydrants, services. $50,000. G. Baker, Willowdale, engr.

Ont., Toronto—City Council 12 in. c.i. main, on Ellerbeck Ave. $63,360. R. C. Harris, City Hall engr.

BIDS ASKED

La., New Orleans—Dec. 15, by Sewerage & Water Bd., A. G. Moffat, secy., at office Purchasing Agent, 526 Carondelet St., waterworks, sewerage and drainage construction during 1932.

Mich., Dearborn—See "Contracts Awarded."

N. Y., Long Island City—Nov. 17, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, general contract, plumbing, heating and electrical work for iron removal and filter plant, at Fresh Meadow Lane and Underhill Ave., Queens Boro.

CONTRACTS AWARDED

Calif., San Francisco—City Council and Bd. Comrs., San Francisco Co., constructing Red Mountain Bar Siphon in connection with Hetch Hetchy Project, to Macdonald & Kahn, Financial Center Bldg., $174,369. Noted July 19.

Ind., Speedway—Town Trustees, 150,000 gal. elevated steel water tank on tower, to Pittsburgh-Des Moines Steel Co., 38 South Dearborn St., Chicago, Ill.; brick, concrete pumping station, to C. H. Turner, 5254 West 14th St., Indianapolis; installing pipe and specialties, to Edgar-Milan, Plainfield; drilling wells, to H. R. Lamb, Carmel. Est. $50,000. Noted Oct. 22.

Ia., Anamosa—Men's Reformatory, c/o State Bd. Control, Des Moines; waterworks improvements, distribution system, incl. collecting well, pump house, pumping equipment and force main at Iowa Men's Reformatory, to E. L. Royer Constr. Co., Valley Junction. $22,933.

Md., Baltimore — Bd. Awards, furnishing, erecting pumping equipment for Pikesville Automatic Pumping Station, to Industrial Power Equip. Co., West Camden St., $10,768. Noted Sept. 17.

Mass., Cambridge—For 36 in. water main in Cambridge-Watertown and Waltham, to J. J. Coughlin & Sons, Inc., 27 School St., Boston, est. exceeds $15,000; furnishing steel pipe for Stony Brook mains, to Walsh's Holyoke (Mass.) Steam Boiler Wks., 110 Appleton St. Noted Oct. 15.

Mass., Cambridge—City, filter plant addition and pumping station at Flesh Pond, Scheme A, to J. M. Tobin, 40 Central St., Scheme B, to Roberts Filter Mfg. Co., 53 State St.; pump, to Turbine Equipment Co. of New England, 80 Federal St., all foregoing of Boston. Est. $100,000. Noted Aug. 20.

Mich., Dearborn—Watermain extensions into Dearborn Hills Sect. 4, 6, and 8 in. c.i. mains to be laid by city forces under supervision O. A. McCarty, supt. Water Dpt.; pipes, valves, fittings to be purchased by city. $60,000. Bond issue approved.

Minn., Golden Valley—Village, A. C. Brown, recdr., 12,000 lin.ft. c.i. mains, hydrants, to Phelps Drake Co., 825 Metropolitan Life Bldg., Minneapolis. $16,000.

Minn., Worthington—For 250,000 gal. tank on 100 ft. tower, to Pittsburgh-Des Moines Steel Co., Tuttle and Southwest 10th St., Des Moines, Ia., $14,900.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue S, to Kindem Constr. Co., 4197 Park Ave., $117,800. Noted Oct. 22.

O., Oak Hill—New waterworks and sewage disposal system, to P. E. Bickle, Inc., Massillon, $122,500. Est. $145,000.

N. J., Paterson—Passaic Valley Water Comn., 158 Ellison St., cast stone for Great Notch Pumping Station, to A. Federici, 304 East Railway Ave.; steel, to J. Rachlifke & Sons, 96 Prospect St. Est. $5,000. Noted Oct. 1.

Pa., Oil City — City Council, general overhauling high and low pressure pumps in waterworks, to National Transit Pump & Machine Co., North Petroleum St., $15,000 cost plus percentage basis.

Wis., Milwaukee—Mains in North 30th St. from West North Ave. to West Galena St., to Milwaukee Sewer & Drain Co., 2510 North Humboldt Ave., $8,404; in North 30th St. from West Burleigh to West Townsend Aves., to Ribbens Bros., 5016 North Woodburn St., $7,781.

Ont., New Hamburg—See "Proposed Work."

SEWERS

PROPOSED WORK

N. Y., Geneva—Dpt. P. Wks., J. W. Brennan, supt., sanitary sewerage system, 2 disposal plants. $380,000. N. S. Hill, Jr., 112 East 19th St., New York, consult. engr.

O., Columbus—City Council adopted ordinance for appropriation $440,000 to complete another link in Olentangy-Scioto Intercepting storm sewer, Spruce and Perry Sts., Pennsylvania, 1st, Oregon and 2nd Aves.

Pa., Columbia—City Council sanitary sewerage system, $300,000. Remington, Vosbury & Goll, 509 Cooper St., Camden, N. J., consult. engrs.

Pa., West View—Boro, trunk sewer in Girtys Run. Election soon $75,000, for same. H. P. McKown, West View, engr.

Tex., Refugio—City, c/o J. O. West, mayor, soon takes bids 2 mi. concrete storm sewers in business district. $100,000. Hawley, Freese & Nichols, 3063 Frost Bldg., San Antonio, and 411 Capps Bldg., Fort Worth, engrs.

Wis., Milwaukee—Sewerage Comn., main feed and return sludge channels in connection w.p. extension disposal plant. J. L. Forebee, ch. engr.

Ont., Milton—Council, G. A. Hemstreet, clk., sewage disposal plant, sanitary sewer. $50,000.

Ont., Hamilton—For 8 in. and up, vit. tile storm and sanitary sewers in sections East 38th, East 39th, East 18th and Crockett St. $26,300. W. L. McFaul, City Hall, engr.

See proposal advertising on page 68

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LEADITE

Trade Mark Registered U.S. Pat. Office

We use no "superlatives" in advertising and selling LEADITE—

—for the Results obtained by the use of LEADITE speak for themselves—

(*and have, for over a Quarter Century*)

The pioneer self-caulking material for c.i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

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Sewers (Continued)

Ont., Kenora—Town Council 8 in. and up vitr. tile sanitary and storm sewers, manholes, connections, catch basins in various streets. $65,000. H. T. Crosbie, Kenora, engr.

Ont., Merritton—Town vitr. tile sewer in Merritt St. $25,000. A. L. McPhail, St. Catharines, engr.

Ont., North Bay—For 8 in. and up vitr. tile sewers. $30,000. F. G. Mackie, City Hall, engr.

Ont., Orillia—Town 8 in. and up vitr. tile storm and sanitary sewers, manholes, house connections. $61,000. L. G. McNeice, Orillia, engr.

Ont., Pembroke—Town Council soon takes bids supplying, installing 2,200 ft. 24 in. c.i. outlet pipe, one 12,000 gal. pump, 5,000 ft. sewers. $60,000.

Ont., St. Thomas—For 8 in. and up, vitr. tile storm sewers, connections in various streets. $32,000. W. C. Miller, City Hall, engr.

Ont., Toronto—North York Twp., 8 in. and up vitr. tile storm and sanitary sewers. $30,000. G. Baker, Twp. Officers, Willowdale, engr.

BIDS ASKED

Calif., Redlands—See "Contracts Awarded."

Ill., Galesburg — Nov. 21, by Bd. Trustees Galesburg Sanitary Dist., Contr. D. Cedar Fork Impvt. Cedar Fork Channel-Intercepter Sewer, bridges. $200,000. Alvord, Burdick & Howson, Hartford Bldg., Chicago, Ill., engrs. Noted Oct. 29.

Ia., Bettendorf—Nov. 23, by City Council, Belvedere Street Interceptor Sanitary Sewer, incl. 10- to 24-in. rein.-con. pipe and laterals, manholes. $25,699. A. Fritz, city engr. H. F. Abrahamson, city clk.

Kan., Humboldt—See "Contracts Awarded."

Mass., Quincy — Nov. 25, by Metropolitan Dist. Comn., sewerage div., 20 Somerset St., Boston, furnishing, erecting 2 centrifugal electrically driven pumping units, vertical type, incl. piping, valves, switchboard, wiring, etc., for Squantum Pumping Station, South Metropolitan Sewerage System.

Mich., Dearborn—See "Contracts Awarded."

New York—Dec. 4, by Westchester Co. Sanitary Sewer Comn., Court House Annex, White Plains, 4,600 ft. 21- to 60-in. trunk sewer for Sect. B, South Yonkers Project, Yonkers; 650 lin.ft. steel bulkhead with loose rock and dredged fill from Harbor Island to Village of Mamaroneck. W. W. Young, consult. engr.; adv. E. N.-R. Nov. 12.

N. Y., Ardsley—Village bids after Nov. 6, sewers, pumping station, $125,000. J. M. Welch, Ardsley, engr. Noted Sept. 3.

N. Y., New York—Nov. 18, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in 49th St., sanitary sewer and temporary sanitary by-pass in 12th Ave., in connection with West Side Improvement of New York Central R.R.

N. Y., Sonyea — Nov. 24, by Dept. Mental Hygiene, State Office Bldg., Albany, sewers and water lines for bakery and chapel buildings at Craig Colony. F. W. Parsons, comr.; adv. E. N.-R. Nov. 12.

O., Rocky River—Nov. 14, by City, sewage disposal plant, rein.-con. tanks, pump house and administration building. $90,000. C. W. Courtney, East 11th St. and Walnut Ave., Cleveland, engr.

S. D., Rapid City—Nov. 30 (extended date), by Bd. City Comrs., C. I. Leedy, aud., City Hall, sewage treatment plant. $215,000. H. W. Zolpher, city engr. A. A. Chenoweth, 320 Paulton Blk., Sioux Falls, consult. engr. Noted Oct. 22.

Utah, Salt Lake City—Nov. 18, by City Comn., 7,397 ft. 8 and 10 in. vitr. tile sewer in Paramount Ave., 2nd West, 7th South, Melbourne Sts. H. Jessen, city engr. Noted Nov. 12.

Wis., Ripon—See "Contracts Awarded."

Wis., Thorp—See "Contracts Awarded."

Ont., Toronto—See "Contracts Awarded."

Que., Montreal—Nov. 17, by Executive Com., 4th sect. trunk sewers. $250,000 or more.

CONTRACTS AWARDED

Calif., Redlands—City Council, Imhoff tank type sewage disposal plant, 1.5 mi. southeast of town, also 7,500 lin.ft. 18 in. pipe and double barrel syphon using 15 in. and 12 in. concrete pipe outfall sewers, force account under direction G. S. Hinckley, engr., City Hall; 4,000 ft. 18 in. vitr. pipe, to Pacific Clay Products, 1151 South Bway., Los Angeles. Other material to be purchased in open market. $90,000 bonds voted for same.

Kan., Humboldt—Sewage disposal plant, auxiliary piping, day labor. $20,000-$25,000. Purchasing materials at once. A. C. Moore, 4th and Duquesne Sts., Joplin, Mo., engrs.

Md., Baltimore—Bd. Awards, storm drains in Sewer Dist. G-11, Storm Water Contr. 169, to F. Angelozzi, 123 South High St., $10,000.

Mass., Boston—Metropolitan Dist. Comn., 20 Somerset St., constructing Sect. 125, South Metropolitan Sewerage System to G. M. Byrne 294 Washington St., $99,931. Noted Oct. 22.

Mich., Dearborn—Monolithic concrete sewer and sludge line connecting east sewage disposal plant with west plant, Greenfield and Butler Rds., day labor under supervision. M. B. Owen, supt. P. Wks. $65,000. City Engineering Dept., engrs.

Nev., Las Vegas—City Council, improving, extending vitr. tile sanitary sewerage system, to Fuller Constr. Co., Republic Bank Bldg., Dallas, Tex., $106,510. Est. $150,000. Noted Oct. 15.

Mo., Richmond Heights—Sanitary sewers in Dist. 3, to H. A. Henske, 401 Laurel Ave., St. Louis, $22,155.

O., Akron—E. A. Kemmler, dir. P. Serv., sewers and house connections, incl. 6,870 ft. 8- to 36-in. brick pipe, 143 house laterals in Dan St. et al., to T. E. McShaffrey Constr. Co., 173 South Forge St., $41,797. Est. $51,800.

O., Akron—City, E. A. Kemmler, dir. P. Serv., sanitary sewerage system, house laterals in Allenside Allotment, Contr. 1, incl. 8,100 ft. 8- to 24-in. pipe, 150 cu.yd. rein.-con., 400 ft. piling, to F. George, 1657 Mahoning Ave., Youngstown, $34,559 est. $45,000. Contr. 2, incl. 6,280 ft. 8- to 21-in. pipe, 190 cu.yd. rein.-con., 400 ft. piling, to De Luca Constr. Co., 140 North Summit St., $18,801 est. $26,000. Noted Oct. 8.

O., Cleveland —City, Easterly Sewage Treatment Plant, Contr. 73, (Type B revolving type equipment), to American Constr. Co., 1276 West 3rd St., $2,736,874. Noted Oct. 1.

O., Oak Hill—See "Waterworks."

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., branch sewers in Coulter St. from St. Vaux to Henry Sts., to Leva Bros., 104 West Gale St., $2,779; Elmwood Ave. from 75th to 76th Sts., to D. Savine, 636 North 66th St., $4,987; main relief sewer in Fairmount Park and Fairmont Ave. between present terminus near Pennsylvania Ave. and 23rd St., to F. A. Canuso & Son, 804 South 12th St., $135,353. Grand total $143,119. Noted Oct. 22.

Wis., Ripon—City, F. A. Preston, clk., will purchase clarifier sludge digestion tank, dosing tank, for remodeling sewage disposal plant. Work will be done by day labor. G. A. Krasin, Marshfield, engr.

Wis., Thorp—City, H. Holtzhausen, clk., will remodel disposal plant, incl. grit chamber, screen, digestor heater, clarifier and digestion tank, day labor. G. A. Krasin, Marshfield, engr.

Ont., Toronto—Vitr. tile storm sewer outlet in Pope Ave., day labor. $49,200. R. C. Harris, city engr.

WASTE DISPOSAL

BIDS ASKED

D. C., Wash.—Dec. 8, by District Comrs., District Bldg., 1 story, 100 x 148 ft., brick, steel incinerator building, concrete pile found. with two 126 ft. radial brick chimney and 1 story, 70 x 100 ft. incinerator with one 160 ft. radial brick chimney; adv. E. N.-R. Nov. 12.

BRIDGES

PROPOSED WORK

Calif., Yuba City—Joint Hy. Dist. 12, Sutter Co., bids about March, two 120 ft. steel and two 40 ft. span, probably concrete, double leaf bascule bridge. $190,000. E. Von Geldern, Yuba City, engr.

Massachusetts — Commonwealth of Massachusetts, Metropolitan Dist. Comn., Boston, preparing plans concrete, steel bridge over Saugus River between Lynn and Revere. $1,000,000. J. R. Worcester & Co., 79 Milk St., Boston, engrs. Noted Mar. 12.

Alta., Calgary—Replacing 25th Ave. bridge, steel superstructure on concrete pier, timber abutments. $45,000.

Ont., Franktown—Canadian Natl. Ry., T. T. Irving, Toronto, ch. engr. (Central Region) and Lanark Co., 200 to 300 ft. concrete, steel overhead bridge over Canadian Natl. Ry. on Franktown Rd. $30,000. G. S. Walker, Perth, co. engr.

Ont., Welland—City Council, A. B. Crealock, engr., 702 Kent Bldg., 156 Yonge St., Toronto, engr., 195 ft. steel superstructure, or all concrete superstructure bridge, 36 ft. roadway, two 6 ft. sidewalks over Welland River, North Main St.

BIDS ASKED

California—Nov. 18, by C. H. Purcell, engr. State Hy. Comn., Sacramento, four 52 ft. span rein.-con. girder bridge, on concrete piers and bents, over Clear Creek, 18 mi. west of Redding, Shasta Co.

Calif., Los Angeles—Nov. 16, by Bd. Supervs. Los Angeles Co., 466 ft. timber, steel bridge, 50 ft. wide, 40 ft. between curbs of roadway, two 5 ft. sidewalks, and carrying single track for Electric Ry. over San Gabriel River at Alamitos Bay, for Los Angeles Co., Long Beach, Seal Beach and Orange Co. $40,000. W. D. Armstrong, Hall of Records Bldg., engr. Noted Sept. 17.

Georgia—See "Streets and Roads."

Illinois—Nov. 30, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, two 25 ft. span, two 16 ft. span rein.-con. slab bridge, one 45 ft. span rein.-con. girder bridge Route 73, Sect. 106-B, Stephenson Co.—23 ft. rein.-con. slab bridge, one 20 ft., one 35 ft. and one 30 ft. span rein.-con. girder bridges, Route 73, Sect. 109-B, Stephenson and Carroll Counties —rein.-con. substructure and 130 ft. steel superstructure, Route 83-A, Sects. 121-B and C, Henderson Co.—three 40 ft. span rein.-con. girder bridge, two 20 ft. span rein.-con. slab bridge, Route 116-A, Sect. 102-B, Marshall Co. —one 40 ft. span rein.-con. girder bridge, two 30 ft. span rein.-con. slab bridge, Route 127, Sect. 102—one 39 ft. span and four 26 ft. span rein.-con. girder bridge, Route 127, Sect. 105-V-B, all Montgomery Co.—4 steel I-beam bridges on concrete piles, rein.-con. substructure, fifteen 50 ft. steel I-beam approach spans on concrete piles, Route 139, Sect. 101-B—125 ft. steel superstructure, Route 139, Sect. 101-C, both White Co. — two rein.-con. substructures four 50 ft. span rein.-con. girder approach spans, Route 148, Sect. 129-B—one 70 ft. and two 170 ft. span steel superstructure, Route 148, Sect. 126-C, both Williamson Co.—rein.-con. substructure, and 140 ft. steel superstructure, Routes 153 and 177, Sect. 110-B and C Washington Co. F. T. Sheets, ch. hy. engr.

Ill., Galesburg—See "Sewers."

Maryland—Nov. 17, by State Roads Comn., Baltimore, G. C. Uhl, chn., substructure, superstructure (with exception structural steel span over railroad tracks), approaches, etc., for proposed grade elimination over relocated tracks of Pennsylvania R.R., Contr. C-76-23, and fabrication and erection structural steel girder span for above grade elimination, North St., Elkton, Contr. Ce-122-23, both Cecil Co.—fabrication, erection of structural steel superstructure, for bridge over Monocacy River, Contr. F-181-37, Frederick Co.—2 jetties at ocean City, Contr. Wo-108, Worcester Co.; adv. E. N.-R. Nov. 12.

Massachusetts—See "Streets and Roads."

Michigan—Nov. 17, by J. T. Sharpensteen, div. engr., Escanaba, Flr. 1 of 2-14 Contrs. 2 and 3, three 50 ft. spans, 30 ft. roadway, 2 rein.-con. abutments, semi-gravity type, steel deck girder, rein.-con. floor and wearing surface, two 2 ft. sidewalks, Alger Co., for State Hy. Comn., Lansing.

Michigan—Nov. 19, by H. W. Hazaman, div. engr., 504 Eddy Bldg., Saginaw, Mlle 1 of 77-21-5, Contrs. 2 and 3, one 70 ft. span, 2 rein.-con. abutments, semi-gravity type, steel deck girder, concrete floor and wearing surface, metal fabricated railing, 40 ft. roadway, two 6 ft. sidewalks, St. Clair Co., for State Hy. Comn., Lansing.

New Jersey—Dec. 7, by State Hy. Comn., Trenton, bridge over Raritan River S.R. Route S-28, Sect. I, Middlesex Co., A. L. Grover, ch. engr.; adv. E. N.-R. Nov. 12.

New York—Nov. 16, by A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, core borings for proposed Meeker Ave. Bridge over Newtown Creek, Brooklyn and Queens Boros.

New York—Nov. 20, by Westchester Co., Court House, White Plains, reconstructing bridge over Mamaroneck River, on Mamaroneck Ave., C.R. 8, Harrison and Mamaroneck, J. Downer, White Plains, co. engr.; adv. E. N.-R. Nov. 12.

Ohio—Nov. 17, by O. W. Merrell, dir. State Hy. Dpt., Columbus, bridges in Ashland, Columbiana, Coshocton, Crawford, Defiance, Logan, Monroe, Noble, Ottawa, Seneca, Shelby, Tuscarawas, Van Wert and Williams Counties, some of larger projects are 70 ft. steel beam bridge, 34 ft. roadway, two 3 ft. sidewalks on Sect. "Galion" Mansfield-Galion Rd., Crawford Co. $19,140—three 40 ft. span beam bridge 24 ft. roadway, Sect. "A" Dayton-Longview Rd., Logan Co. $24,869—one 36 ft. and one 32 ft. concrete beam bridges each 29 ft. roadway, Sect. "B"-I McConnelsville-Cambridge Rd., Noble Co. $21,436 — continuous steel beam bridge, incl. two 80 ft. center spans, two 64 ft. end spans, 24 ft. roadway, two 3 ft. sidewalks, Sect. "A"-1 Freemont-Oak Harbor Rd., Ottawa Co. $89,980—three 45 ft. span concrete beam bridge, 24 ft. roadway, Sects. "C" and "Q" Sidney-Versailles Rd., Shelby Co. $25,843—two 35 ft. span concrete slab and girder bridge, 24 ft. roadway, Sect. "E" Carrollton-Canal Dover Rd. $21,127—24 ft. concrete slab bridge, 30 ft. roadway, two 3 ft. sidewalks, 60 ft. concrete slab and girder bridge 30 ft. roadway, two 3 ft. sidewalks, Sect. "A" New Philadelphia-Northern Rd. $30,074, all Tuscarawas Co. Total est. $304,522.

O., Lisbon — Comrs. Columbiana Co., bids about Nov. 29, reconstructing old steel bridge, replacing floor, raising piers. $25,000. L. C. Kirk, Lisbon, engr.

Tex., Austin—Nov. 28, by Bd. Regents, University of Texas, c/o J. W. Calhoun, comptroller, 2 arch, 60 ft., rein.-con. bridge over Waller Creek, San Jacinto Blvd., at Sts. 36/03, $30,000; 3 arch, 65 ft., rein.-con. bridge over Waller Creek, San Jacinto Blvd., at Sts. 2/90, $40,000. H. F. R. Helland, City Hall, engr.

Tex., Houston—Dec. 2, at office City Secretary, rein.-con. steel bridge over White Oak Bayou, on White Oak Dr. Noted Sept. 10.

Washington—See "Streets and Roads."

Que., St. Mathieu—Nov. 30, by A. Boisvert, secy.-treas., Lac Bellemore, 3 span 29 ft. concrete slab bridge over Shawinigan River, on Blais Site, for Municipal Council.

CONTRACTS AWARDED

Calif., Los Banos—State Hy. Comn., Sacramento, five 19 ft. span, sixteen 19 ft. span and twelve 19 ft. span timber bridges, Merced Co., near here, to Thermatite Constr. Co., 580 Stockton Ave., San Jose, $30,098. Noted Oct. 8.

Idaho—A. Harbour, comr. P. Wks., Boise, 351 ft. steel viaduct over Canyon Creek, and ¼ mi. approaches, Madison Co., to Zollinger & Wheelwright, Rexburg, $29,681.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, 10 approach span, 35 ft. long concrete bridge, Dorchester Co., to Sanford & Brooks Co., South and Water Sts., Baltimore, $145,345. Noted Sept. 10.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, double span concrete slab bridge, Contr. M-191-57, Montgomery Co. to J. S. Bowers, Whiteville, N. C., $7,286—structural steel superstructure, double 102 ft. span steel truss for bridge, Contr. A-109-64, Allegany Co., to Roanoke Iron Works, Roanoke, Va., $15,968—single span concrete slab bridge, Contr. M-170-37, Montgomery Co., to Fredericksburg Bridge Co., Fredericksburg, Va., $3,177—concrete shoulders 1.64 mi. hy., Contr. M-172-311, Montgomery Co., to Northern Virginia

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Bridges (Continued)

Contg. Co., Clarendon, Va., $16,788. Grand total $43,757. Noted Sept. 24 and Oct. 22.

Massachusetts—Dpt. P. Wks., State House, Boston, A. W. Dean, engr., 3 span. 782 ft. deck girder bridge over Connecticut River between Erving and Gill, to McClintic-Marshall Corp., Bethlehem, Pa., $256,910. Noted Oct. 22.

Michigan—A. L. Burridge, div. engr., Cadillac (a) FX2 of 35-1-7C-1 and 2, one 40 ft. span, 30 ft. roadway, 2 rein.-con. abutments, steel deck girder with rein.-con. floor, concrete surface, two 2½ ft. sidewalks. (b) FX1 of 35-1-7C1 and 2, 39 ft. 6 in. span, 30 ft. roadway, 2 rein.-con. abutments, counterfort type, steel deck girder, rein.-con. floor and surface, two 2½ ft. sidewalks, both Iosco Co., for State Hy. Comn., Lansing, to McClintic-Marshall Corp., 1242 Book Bldg., Detroit, Contr. 1 (a) $868; (b) $886; to Chas. G. Milne, Saginaw, Contr. 2 (a) $12,139 (b) $16,472. Grand total $30,365. Noted Oct. 15.

Michigan—A. L. Burridge, div. engr., Cadillac, MB1 of 5-7-2C-1 and 2, one 60 ft. span, 40 ft. roadway, 2 rein.-con. abutments, steel deck girder with rein.-con. floor surface, spindle railing, two 6 ft. sidewalks, Antrim Co., for State Hy. Comn., Lansing, Contr. 1, to Fort Pitt Bridge Wks., Massillon, O., $2,639; Contr. 2, to L. W. Lamb, Jackson, $19,937. Noted Oct. 22.

O., Zanesville—City, 2 span 216 ft. concrete bridge, to Swingle & Robinson Constr. Co., 337 South High St., Columbus. Noted Oct. 22.

Pennsylvania — State Hy. Dpt., Harrisburg, one 87 ft. and one 80 ft. deck plate girder, six 55 ft. and two 66 ft. rein.-con. girder span steel, rein.-con. viaduct, Route 296, Clifford Twp., Susquehanna Co., to L. L. Keister, Lewisburg, $89,555. Noted Oct. 15, under "Streets and Roads."

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., founds., steel and concrete superstructure, paving, sidewalks for viaducts on line Schuylkill Ave. West and 30th St. between Market and Arch Sts., to F. A. Canuso & Son, 804 South 12th St., $247,469.

Pa., Pittsburgh—Allegheny Co., paving superstructure and north approach bridge over Ohio River from Saw Mill Run to Beaver Ave., incl. 3,500 cu.yd. embankment, 4,000 lin.ft. bridge curb, 2,080 lin.ft. granite curb, 1,100 cu.yd. concrete base course, 5,250 sq.yd. gravel stone for slag, 3,650 sq.yd. light weight concrete base course, 16,800 sq.ft. concrete sidewalks on approaches 21,200 sq.ft. concrete sidewalks on superstructure, 1,350 tons tar asphaltic concrete binder, 12,500 sq.yd. asphaltic surfacing, 5,000 lin.ft. lane markers, 12 sidewalks, chutes, to Harrison Constr. Co., 21st and Sidney Sts., S. S., Pittsburgh, $67,280; paving superstructure gunite protection Boston Bridge, to H. W. Butler, 700 Walnut St., McKeesport, $14,899. Noted Oct. 8.

Wis., Wausau—Marathon Co., J. A. Clark, comr., bridge, to Milwaukee Bridge Co., 3282 North 34th St., Milwaukee, $154,829. Est. $160,000. Noted Sept. 10.

Ontario — Dpt. Hys., Parliament Bldgs., Toronto, Ops Bridge, Contr. 31-71, to Ontario Constr. Co., Bank of Toronto Bldg., St. Catharines—Oil Springs and Oil City Bridges, Contr. 31-72, to Ontario Bridge Co. Ltd., Crown Office Bldg., Todonto—culvert, 2 mi. east of Iroquois, Contr. 71-73, to F. Stidwell, 4228 2nd St., Cornwall, all foregoing, concrete founds., concrete, steel superstructures, Est., $70,000.

Ont., Sudbury — Concrete, rein.-con. bridges over Junction Creek, Elm St., to A. Chirico, 89 Front St., North Bay; over Nolin's Creek, Beech St., to Duncan Constr. Co., 30 Cedar St., Sudbury. Est. $25,825.

STREETS AND ROADS

BIDS ASKED

California—Nov. 18, by C. H. Purcell, engr., State Hy. Comn., Sacramento, grading, bituminous treated crushed gravel or stone surfacing 8.5 mi. road between Casa Diablo Hot Springs and Crestview, Mono Co.

Delaware—Dec. 1, by State Hy. Dpt., Dover, grading, borrow, concrete sidewalks, 7,000 ft. Newport-Cranston Heights, Contr. 207—5,400 ft. McDaniel Heights-Tallyville, Contr. 221—1,525 ft. Townsend-Ginn's Corner, Contr. 222—4,150 ft. Laurel towards Delmar, Contr. 223—borrow, 2,300 ft. Chestnut St. Cutoff-New Castle, Contr. 219—380 ft. timber bridge, Woodland Beach Causeway, Contr. 208—clearing, grubbing, grading, borrow, concrete on broken stone base course surfacing 4.76 mi. Reynold's Corner-Fieldsboro, Contr. 220—20,000 lb. 50% ditching dynamite, Contr. W; adv. E. N.-R. Nov. 12.

Georgia—Nov. 17 and Dec. 15, by State Hy. Bd., East Point, grading 72 mi., surfacing 63 mi. hys., constructing 8 bridges in 25 counties. Total est. $1,300,000.

Illinois—Nov. 30, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete bituminous filled brick on concrete, bituminous concrete (either fine or coarse graded aggregate type) on concrete surfacing 0.65 mi. Route 21, Sect. 5V-X, Dist. 1, 18 ft.—0.15 mi. Route 59, Sect. 106X-Dist. 1, 20 ft., both Lake Co.—1.08 mi. Route 46, Sect. 462Y-2—two 10 ft. strips, 0.37 mi. Route 46, Sect. 463Y-1, 10 ft., both Dist. 1, Cook Co.—6.04 mi. Route 65, Sect. 652, Dist. 1, 20 ft. DuPage, Kane and Kendall Counties—5.31 mi. Route 78, Sect. 136, Dist. 4, Fulton Co.—4.21 mi. Route 85, Sect. 132, Dist. 4, Henry and Knox Counties—5.96 mi. Route 83-A, Sect. 121, Dist. 4, Mercer Co.—5.6 mi. Route 116-A, Sect. 102, Dist. 3, Marshall Co.—9.71 mi. Route 120, Sect. 113, Dist. 5, DeWitt Co.—4.16 mi. Route 127, Sect. 102, Dist. 8—4 mi. Route 127, Sect. 103-X, Dist 8, both Montgomery Co.—7.62 mi. Route 128, Sect. 102, Dist. 7, Shelby, Fayette and Effingham Counties—6.99 mi. Route 128, Sect. 103, Dist. 7, Fayette and Effingham Counties—8.08 mi. Route 130, Sect. 112, Dist. 5, Cumberland Co.—5.36 mi. Route 148, Sect. 129, Dist. 9, Franklin and Williamson Counties, all foregoing 18 ft. wide—0.44 mi. Route 173, Sect. 136-S Dist. 1, 20 ft., Lake Co.—7.88 mi. Routes 153 and 177, Sect. 110, Dist. 8, 18 ft., Washington Co. — grading, drainage structures 0.2 mi. Route 12, Sect. 1X-1A, Dist. 7 Lawrence Co.—7.98 mi. Route 73, Sect. 106A, Dist. 2 Stephenson Co.—7.26 mi. Route 73, Sect. 109-A, Dist. 2 Stephenson and Carroll Counties—3.57 mi. Route 139, Sect. 101-A, Dist. 7 White Co. F. T. Sheets, ch. hy. engr.

Indiana—Nov. 24, by State Hy. Comn., Indianapolis, **(P. means Project, and F.A.P. Federal Aid Project)** concrete, bituminous concrete, brick, asphaltic macadam or rock asphalt surfacing 12.618 mi. State Rd. 57 from Petersburg to Washington, 18 ft., F. A. P. 62-A Pike and Daviess Counties—0.854 mi. State Rd. 49 north and south of South Shore Electric R.R. overhead crossing, 40 ft., P.180A-B1 Porter Co.—14.729 mi. State Rd. 18 from Marion to point 1 mi. east of Roll, 20 ft., F. A. P. 239-AB Grant and Blackford Counties — 8.306 mi. State Rd. 25 from Lafayette to Americus, 18 ft., F. A. P. 243-A Tippecanoe Co.—6.02 mi. State Rd. 25 from Americus to Delphi, 18 ft., F. A. P. 243-B Tippecanoe and Carroll Counties —14.609 mi. State Rd. 16 from State Routes 4 to 53 via Brook, 18 ft., P.259A Newton and Jasper Counties — 2.375 mi. State Rd. 27, Monroe Cut-off, 20 ft., P.299 Adams Co.—concrete, brick, bituminous retread, bituminous coated aggregate or rock asphalt surfacing 7.654 mi. State Rd. 43, 18 and 20 ft., F. A. P. 273-A Owen and Putnam Counties—23.061 mi. State Rd. 29 from Madison to Versailles, 18 and 20 ft., F. A. P. 280-AB Jefferson and Ripley Counties—combination bids on 14.326 mi. F.A.P. 243-A and B. State furnishes concrete if constructed of concrete, brick, or bituminous concrete on concrete, except concrete right-of-way markers and rein.-con. pipe. Contractor to furnish if constructed as bituminous type on macadam. J. J. Brown, dir.

Ind., Evansville—Nov. 19, by Bd. Supervs. Vanderburgh Co., asphaltic concrete surfacing Washington Ave. from Knight Twp., $22,248; macadam surfacing Alvord Blvd., Knight Twp., $13,823. E. D. Koenemann, Evansville, co. aud.

Kentucky—Nov. 24, by State Hy. Dpt., Frankfort, grading, drainage structures 9.952 mi. Hopkinsville-LaFayette Rd., State Aid Project 10-GG, Christian Co.—1.55 mi. Gamaliel-Tennessee State Line Rd., State Aid Project 403-AG, Monroe Co.—paving fill slopes Henderson-Owensboro Rd., State Aid Project 8-C2, Henderson Co. B. Johnson, chn.

Massachusetts—Nov. 17, by Dpt. P. Wks., State House, Boston, A. W. Dean, engr., bituminous macadam paving 14,330 ft. hy., incl. 2 span plate girder bridge, Boston and Brookline —1,510 ft. hy., incl. rein.-con. beam bridge, Uxbridge—rein.-con. and bituminous macadam (dual type) paving 21,402 ft. hy., incl. 3 span steel stringer bridge, Lakeville and Middleboro.

Massachusetts—Nov. 17, by Dpt. P. Wks., Boston, bituminous macadam paving 12,996 ft. hy., incl. rein.-con. bridge, and rein.-con. bridge extension, Salem and Swampscott. A. W. Dean, Dpt. P. Wks., Boston, engr.

Massachusetts—Nov. 24, by Dpt. P. Wks., Boston, bituminous macadam paving 19,306 ft. hy., incl. rein.-con. bridge, and concrete bridge extension, Needham and Wellesley. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Dedham—See "Contracts Awarded."

Michigan—Nov. 16, by J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures 4.311 mi. FO36-18C-1, Iron Co., for State Hy. Comn., Lansing.

Michigan—Nov. 17, by H. G. Oakes, div. engr., Plymouth, widening grade, lengthening drainage structures 6.374 mi. M019-22C-6, Clinton Co.; grading, shaping, drainage, concrete paving 2.224 mi. M013-17C-1, M013-21C-1 and M012-20C-1, Calhoun and Branch Counties, for State Hy. Comn., Lansing.

Michigan—Nov. 17, by A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage, 16 ft. one course gravel surfacing, 5.005 M020-16C-1, Crawford Co.—grading, drainage structures 7.174 mi. M0520C-1, Anti-m Co.—grading, shaping, drainage, 16 ft. two course gravel surfacing 1.51 2mi. M043-11C-1, Lake Co., for State Hy. Comn., Lansing.

Michigan—Nov. 18, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, drainage structures 2.739 mi. M073-6C-3, Saginaw Co., 8.2 mi. FO25-22C-2, Genesee and Shiawassee Counties for State Hy. Comn., Lansing.

Michigan—Nov. 19, by W. J. Kingscott, div. engr., 213 Watson Bldg., Grand Rapids, grading, shaping, 40 ft. concrete paving 0.199 mi. M041-30C-6, Kent Co.; grading, drainage structures 5.512 mi. FO70-28C-1 and FO61-27C-2, Ottawa and Muskegon Counties, for State Hy. Comn., Lansing.

Nevada — Nov. 18, by Director Dpt. Hys., Carson City, grading, crushed rock or gravel surfacing 93,100 cu.yd. hy. between Sand Springs and Eastgate, Route 2, Sects. D1 and 2, E1 and 2, Churchill Co.

New Jersey—Nov. 18, by Bd. Freeholders Monmouth Co., Court House, Freehold, grading, 9-in. rein.-con. paving 69,755 sq.yd. Route 36, Sect. 2, Keansburg to Atlantic Highlands. C. K. Allen, Jr., Red Bank, co. engr.

N. J., Clarksburg—Nov. 16, by Twp. Com., J. K. Edy, chn., paving 66,000 sq.yd. Perrineville-Baird Corner Rd. and Perrineville-Clarksburg Rd. A. D. Bullock, 128 West St., Trenton, engr.

N. Y., Albany—Bd. Contr. & Supply, City Hall, soon takes new bids reconstructing Van Rensselaer Blvd. from Delaware Ave. to Vanderburgh Ave. $150,000. Former bids rejected.

N. Y., New York—Nov. 13, by S. Levy, pres., Manhattan Boro, Municipal Bldg., grading, sheet asphalt on 9 in. concrete repaving East 71st to West 153rd, Stone and West 163rd Sts.; grading, granite block repaving York Ave.

N. Y., New York—Nov. 18, by S. Levy, pres., Manhattan Boro, Municipal Bldg., grading, sheet asphalt paving Attorney and 53rd Sts.

N. Y., St. George—Nov. 18, by J. A. Lynch, pres. Richmond Boro, Boro Hall, high early strength concrete paving Victory Blvd. from Manor Rd. to Jewett Ave.

Okla., Oklahoma City—Nov. 17, by M. Poshek, Jr., city clk., widening concrete paving 7,800 sq.yd. Harvey St., from Choctaw St. to Reno Ave. $24,410. L. M. Bush, City Hall, engr.

Tex., Austin—Nov. 28, by Bd. Regents, University of Texas, c/o J. W. Calhoun, comptroller, curbing, grading, alternate types paving 7 blocks San Jacinto Blvd. extension through University property from East 19th to 26th St. along Waller Creek, 60 ft. $100,000. H. R. F. Helland, City Hall, engr.

Washington — Nov. 17, by State Hy. Dpt., Olympia, at office S. J. Humes, dir., crushed stone surfacing 19.5 mi. State Rd. 4 from Koller north, Ferry Co.—15.5 mi. State Rd. 4 from Wilbur to Clark, Lincoln Co.—3 mi. State Rd. 22 from Cedonia north, Stevens Co.—crushed stone stock piling, resurfacing 17.1 mi. State Rd. 9, from Tumtumtulips to Quinault River Bridge, Greys Harbor Co.—25.6 mi. State Rd. 12 from Wilmi Slough to Johnsons Landing and from Johnsons Landing to Sand Ridge Rd., Pacific and Wahiakum Counties—grading, drainage structures, clearing 1.9 mi. State Rd. 12 from Beam Rd. to Pe Ell, Lewis Co.—158 ft. treated timber trestle, 24 ft. roadway, two 4 ft. sidewalks over old route of State Rd. 3, near Whitworth, Spokane Co.—160 ft. lin.ft. concrete retaining wall, one 36 ft. and one 40 ft. rein.-con. and one 45 ft. steel girder partial bridges on State Rd. 7 between Vantage and Burke, Grant Co.

Washington—Dec. 1, by Dir. Hys., Olympia, grading, crushed stone surfacing 21,430 cu.yd. State Rd., Lake Samish Branch, Bellington South, Whatcom Co.—33,100 cu.yd. State Rd. 2, Rocklyn to Creston, F. A. P. 7-B, Lincoln Co.—16,190 cu.yd. State Rd. 5, Mossy Rock to Ajlune, F. A. P. 134-C, Lewis Co. — 11,040 cu.yd. S. R. 12, Fort Columbia to Point Ellice, Pacific Co.—resurfacing and stockpiling 15,900 cu.yd. crushed stone on 30 mi. State Rd. 9, Hoodsport to Marple Creek, Mason and Jefferson Counties. S. J. Humes, dir. hys.

Que., Montreal—Takes bids about Nov. 21, constructing pavements $168,590, paving lanes $67,800. Engineering Dpt. preparing plans.

CONTRACTS AWARDED

Calif., Glendale—City Council, burning off 528,922 sq.ft. old surface 14 in. asphaltic concrete on 4 in. asphaltic concrete paving 695,158 sq.ft. Glendale Blvd. from San Fernando Rd. to Monterey Rds., to Southwest Paving Co., 712 Lankershim Bldg., Los Angeles, $29,099.

Calif., San Diego—Bd. Supervs. San Diego Co. re-routing Tia Juana Hy. in town of Ysidro, near national boundary to reach proposed new Custom House, incl. 2,300 cu.yd. concrete curbing, 12,000 sq.ft. concrete sidewalks, 6,450 cu.yd. grading, 2,281 cu.yd. concrete, 708 tons A.C. base, 303 tons A.C. wearing surface, to Griffith Co., 2104 Main St., $22,728.

Colorado—State Hy. Dpt., Denver, rebuilding, surfacing 4 mi. Mountain Hy. Ute pass from Manitou to Cascade, El Paso Co., to Hamilton-Gleason Constr. Co., Tramway Bldg., Denver, $169,181.

Connecticut—J. A. Macdonald, state hy. comr., Hartford, waterbound macadam paving 14,048 ft. Bethmore and Valley Rds., Bethany, to C. W. Blakeslee & Sons, Inc., 58 Waverly St., New Haven—2,600 ft. Griswold St. and rolled gravel surfacing 6,300 ft. Highland St., Wethersfield, to Atlas Sand & Gravel & Stone Co., 50 State St., Hartford—14,700 ft. Putnam, Quidic, 4-Cor. Putnam Line, Porter Plains Rds. and Church Corner Bridge, Thompson, to Medbury & Trowbridge, Main St., Putnam—unrolled trap rock macadam paving 9,702 ft. Mack Way and Strickland Rds., Middlefield, to Town of Middlefield, Town Hall, Middlefield—sheet asphalt on bituminous base paving 2,985 ft. Haight St., Stamford, to P. Bacco, 33 Bank St., Stamford.

Conn., New London — Bituminous macadam paving Montauk Ave., to N. Benvenuti & Sons, 74 Goshen St., $27,320. Est. $25,000.

Florida—State Road Dpt., Tallahassee, resealing State Roads 15, 17, 64 and 73, Pinellas Co. $90,000. Owners build, purchasing flint chat and asphalt oil for same.

Idaho — A. Harbour, comr. P. Wks., Boise, grading, crushed graveling 11.013 mi. Gem and Payette Counties, to Quinn Bros. & Robbins, Boise, $56,915—2.8 mi. Owyhee Co., to W. Devlin, Mountain Home, $8,592—crushed rock paving 7.56 mi. Benewah Co., to Joslin & McAllister, Realty Bldg., Spokane, Wash., $11,392. Grand total $76,899. Noted Oct. 22.

Ill., East St. Louis — See "Sports and Parks."

Ill., Galesburg—Knox Co., grading, culverts, gravel surfacing 5 mi. Rapatee-Maquon Rd., to Roche Bros., 1202 Clarke St., Peoria, $21,311; grading, gravel surfacing 1 mi. Broad St., to

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Streets and Roads (Continued)

Plack Transfer Co., 308 Lafayette St., Peoria, $3,987.

Ia., Denison—Crawford Co. gravel surfacing 22 mi. secondary trunk roads, maintenance, graveling, incl. 12,000 cu.yd. 1 mi. haul, 215,000 additional units, 6,000 cu.yd. pit stripping, 7,000 cu.yd. Class C shipped gravel, to Kriege Constr. Co., Marshalltown.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures, using 1st class double strength vitr. pipe 5.286 mi. road in Floyd Co., to Campbell-Johnson Co., Pikeville, $43,830. Noted Sept. 24.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using 1st class reinforced. pipe 5.184 mi. Warren Co., to J. B. Westerfield, Owensboro, $21,595—grading, drainage structures using corrugated metal pipe 3.133 mi. Butler Co., to Campbell & Co., Bowling Green, $27,730—bank gravel surfacing 4.63 mi. Calloway Co., to N. E. Stone & Co., Madisonville, $8,077. Grand total $57,402. Noted Oct. 22.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using 1st class reinforced. pipe 7.103 mi. Greenville-Rochester Rd., State Aid Project 65-AG and 3.806 mi. same road, Sect. 65-BG, to Young & Lyons, Rogersville, Tenn., $47,331 and $20,164 respectively—grading, drainage structures, using 1st class double strength vitr. pipe 3.152 mi. Central City-Island Rd., to E. O. Korsmo, Memphis, Tenn., $18,584, all foregoing Muhlenberg Co.—bridge over Louisville & Nashville R.R., Todd Co., to Frazer & Cocke, Wickliffe $7,594. Grand total $93,673. Noted Oct. 22.

Louisiana—State Hy. Comn., Baton Rouge, to P. and D. Co., Baton Rouge, gravel surfacing Route 386, $10,071; 4.235 mi. Route 1021, $13,945, both Arcadia Parish; 8.826 mi. road in Beauregard Parish $42,252—to R. C. Webb, Delta, 4.087 mi. Route 819 Catahoula Parish, $12,610—to A. E. Montgomery, Jonesville, 4.128 mi. Catahoula Parish $15,601—to N. P. Turner, Marshall, Tex., 10.887 mi. Beauregard Parish $54,016—to Townsend & Brunson, Bunkie, 3.356 mi. Avoyelles Parish $14,540 — to Forcum James Co., Dyersburg, Tenn., 5.353 mi. road between Bunkie and Route 72, $19,236; 4.983 mi. road between Petite Cote and Route 72, $18,160; 3.314 mi. road between Coules des Goures and Route 5, $11,382, all Avoyelles Parish—to Sullivan, Long & Hagerty, Meridian, Miss., 3.977 mi. Carroll Parish $16,158; 2.121 mi. Bienville Parish $7,289—to Hunter & Drew, Minden, 2.284 mi. Bienville Parish $13,440—to Hardaway Constr. Co., Columbus, Ga., shell surfacing 9.147 mi. Calcasieu Parish $58,632—to W. H. Williams, Arcadia, grading, local iron ore surfacing 6.67 mi. Bienville Parish $22,138—to O. M. New, Little Rock, Ark., grading, drainage structures 4.733 mi. Tulips-Route 115 Rd., $10,797; 6.735 mi. Route 488 between Routes 141 and 115, $18,772, both Claiborne Parish—to Shrumpin Constr. Co., Oakdale, 7.348 mi. Allen Parish $27,068—to W. R. Aldrich & Co., Dyersburg, Tenn., 4.863 mi. Claiborne Parish $8,917—to Leathers & Martin, Alexandria, 7.841 mi. Bienville Parish $18,816; 4.186 mi. De Soto Parish $5,946. Grand total $419,786. Noted Oct. 1.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 1.03 mi. hy. from Fairhaven to Owens Cliff, Contr. AA-124-84, Anne Arundel Co., to Southern Maryland Contg. Co., 20 East Lexington St., Baltimore, $13,769. Noted Aug. 6.

Maryland — State Roads comn., G. C. Uhl, chn., Baltimore, concrete shoulders 3.71 mi. hy. along Braddock Rd. from Cumberland to National Pike, Contr. A-105-611, Allegany Co., to Cumberland Contg. Co., Cumberland, $47,073. Noted Oct. 8.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, macadam paving 1.21 mi. hy. from Avenal toward White Oak, Contr. M-173-34, Montgomery Co., to T. Edgie Russell Co., Frederick, $21,485; concrete shoulders 720 ft. hy. along Market St. between 2nd and 4th Sts., in Pocomoke, Contr. Wo-1-6-111, Worcester Co., to Q. Ashburn, Pocomoke City, $1,514. Noted Oct. 14.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete shoulders 0.6 mi. Contr., H-134-411, Harford Co., to P. Reddington & Son, 2 East Lexington St., Baltimore, $11,830—combination curbing and guttering 0.53 mi. Contr. M-192-55, Montgomery Co., to F. J. Byron, 638 Register Ave., Baltimore, $4,835—concrete base and header 0.3 mi. Contr. P-198-311, Prince George's Co., to Security Contg. Co., Wash., D. C., $7,875—concrete girder bridge, concrete paving 0.73 mi. Contr. M-189-35, Montgomery Co., to Loomis Contg. Co., 1014 Wisconsin Ave., Wash., D. C., $25,602. Grand total $50,142. Noted Oct. 22.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, penetration slag macadam resurfacing 4.68 mi. hy. along Salisbury-Nanticoke Rd., Contr. Wi-56-14, Wicomico Co., to Layfield & Waller Paving Co., Salisbury, $56,318. Noted Sept. 10.

Maryland—State Comn., G. C. Uhl, chn., Baltimore, concrete paving 0.15 mi. hy. along Saratoga Ave. and approaches from Sligo Ave. towards Chestnut Ave., in North Takoma Park, Contr. M-190-32, Montgomery Co., to D. Marine, 236 Albermarle St., Baltimore, $11,285. Noted Oct. 8.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, macadam paving 1 mi. hy. from Old Germantown toward Boyds, Contr. M-186-52, Montgomery Co., to L. R. Waesche & Sons, Thurmont, $16,676.

Md., Baltimore—Bd. Awards, concrete paving 8,000 cu.yd. streets listed in Contr. 605, to F. Benadio, 22 North Linwood Ave., $16,749.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., State House, Boston, reinforced-con. paving 15,971 ft. hy., incl. 3 bridges, Worcester and Shrewsbury, to E. D. Ward Co., 82 Foster St., Worcester, $379,998. Noted Oct. 22.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, constr., sheet asphalt paving Potomac St., Ward 20, to Dooley Bros., Inc., 73 Howard St., Roxbury. Est. $25,000.

Mass., Boston—See "Excavation, Drainage, Irrigation, Levees, Rivers and Harbor."

Mass., Dedham—Town, Bd. Selectmen, improving streets, day labor, $25,000 or more. $24,400 appropriated for part proposed work.

Michigan—A. L. Burridge, div. engr., Cadillac, grading, draining structures, gravel surfacing 9.192 mi. FO4-8C-1 and FO60-26C-2, Alpena and Montmarency Counties, and 7.614 mi. FO4-10C-1 and 2 and FO4-15C-1, Alcona and Alpena Counties, for State Hy. Comn., Lansing, to W. H. Gilfillond, Gladwin, $112,612 and $64,774 respectively. Noted Oct. 22.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, drainage structures 5.667 mi. FO56-20C-2, Midland Co., for State Hy. Comn. Lansing, to T. McNally, Saginaw, $34,178; 10.856 mi. FO76-23C-2, Shiawassee Co., to Bridgeport Core & Sand Co., Saginaw, $99,335. Noted Oct. 22.

Michigan—H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, 2 course gravel surfacing 12.637 mi. M08-19C-2 and M026-15C-2, Bay and Gladwin Counties, for State Hy. Comn., Lansing, to Welker & Van Dosler, Rockford, $85,508. Noted Oct. 22.

Michigan—W. J. Kingscott, div. engr., 309 McNair Bldg., Kalamazoo, grading, shaping, drainage structures, 20 ft. concrete surfacing 7.656 mi. FO3-23-C, Allegan Co., for State Hy. Comn., Lansing, to H. W. McKenzie, Dearborn, $137,431. Noted Oct. 22.

Michigan—H. G. Oakes, div. engr., Plymouth, shaping, concrete paving 0.605 mi. Assessment Dist. Rd. 463C-2, Monroe and Wayne Counties, for State Hy. Dpt., Lansing, to W. H. Knapp, Monroe, $17,081, incl. cement. Noted Sept. 17.

Michigan — J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures 4.034 mi. FO31-29, Contr. 1, for State Hy. Comn., Lansing, Houghton Co., to Thornton Bros. Co., Hancock, $63,885.

Minn., Grand Rapids—Itasca Co., grading 11.5 mi. Forest Hy. Project 44-C, to J. Humphrey, Deerwood, $38,888.

Mo., Clayton—St. Louis Co., Court House, reinforced-con. paving Olive St. Rd. to Moore Bros. Constr. Co., Page and Walton Rds., $32,559—9,100 ft. Woods Mill Rd., to Keeley Bros. Contg. Co., 4301 State St., East St. Louis, Ill., $72,163—Morton Ave., to J. S. Stouby Constr. Co., 423 South Van Buren St., Kirkwood, $13,957—Jorissant Ave., to Missouri Eng. & Contg. Co., 5845 Hamilton Ave., St. Louis, $9,586—Cardondelet Ave., to Creech Constr. Co., 4150 Bingham Ave., St. Louis, $6,057. Grand total, $134,322. Noted Oct. 22.

Mo., Clayton—St. Louis Co., reinforced-con. paving 30,529 ft. Wild Horse Creek Rd., to G. W. Condon Co., Kirkwood—3,950 ft. Laclede Station Rd., to Independent Quarry & Constr. Co., 3650 Chouteau Ave., St. Louis, $32,982—2,800 ft. Bernard Ave. and 1,700 ft. Hornicker Rd., to Industrial Constr. Co., Title Guaranty Bldg., St. Louis, $15,427 and $8,975. Noted Oct. 22.

Mo., Independence—Jackson Co., grading, concrete paving 11,237 sq.yd. Blue Springs Rd., to C. H. Atkinson Paving Co., Watertown, S. D., $21,714; 12,795 sq.yd. 79th St. and Ward Parkway Rd. and 13,599 sq.yd. Sni-A-Bar Cut-off Rd., to Thompson & Penny, Kansas City, $21,445 and $26,074 respectively—100,261 sq.yd. Raytown South Rd., to A. Tobin, 2601 Myrtle Ave., Kansas City, $236,416; 2 new bridges on same road, to Massman Constr. Co., Railway Exch. Bldg., Kansas City, $16,971. Grand total $322,324. Noted Oct. 22.

New Jersey—Bd. Freeholders Morris Co., Court House, Morristown, grading, bridging 9 in. concrete paving hy., Whippany, to W. Eisenberg & Sons, Inc., Fritz Pl., North Plainfield, $261,850. Noted Oct. 1.

N. Y., Albany—Improving Holland Ave., to E. P. Carey, 90 State St., $87,728—widening, resurfacing Lexington Ave., to Campion Co., 21 Cuyler Ave., $9,885—Edison Ave., to V. D. Guilio, $5,095. Grand total $102,708.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, paving Smith St., to Lenze & Hesse, 9020 247th St., Bellrose, $23,561. Noted July 30.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading 97th St. and Far Rockaway Blvd., to F. Gargisco, 2114 Caton Ave., Brooklyn, $7,195 and $9,848 respectively—Inwood St., to Norvine Contg. Co., 529 Albany Ave., Brooklyn, $7,176—Grout Ave., to Welsh Bros., 27 Purvis St., $4,180—Meehan Paving Co., Laurel Hill Blvd., $6,772 and $8,448 respectively—125th St., to W. P. McDonald, 7 Lawrence St., Flushing, $9,244—Queens Blvd., to Carbloe Paving Co., Starg St., Brooklyn, $80,168; mains in Rockaway Blvd., to Sprague Constr. Co., Inc., Alameda Bell Harbor, $11,667. Grand total $153,698. Noted Oct. 29.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., paving Myrtle Ave., to Pomonok Asphalt Paving Co., 1246 Grand St., Brooklyn, $30,492—65th St., to Meehan Paving Co., Laurel Hill Blvd., $5,058—grading 112th St., F. Gargiso Co., 2114 Caton Ave., Brooklyn, $2,667—52nd Dr. and Anderdunk Ave., to Granaglia & Eng. Co., 48 East Kingsbridge Rd., New York, $4,814 and $9,532 respectively — Bordon Ave., to oAckerman & Schierenberger, 1728 Stevens St., $2,622. Grand total $55,185. Noted Oct. 15.

N. Y., New York—H. Brackner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., grading Leland Ave., to F. Gabrielle, 2250 Creston Ave., $8,202; grading East 158th St., to A. Gregorio, 1121 Neil Ave., $1,078. Noted Oct. 22.

O., Cleveland—Cuyahoga Co., paving St. Clair Rd. extension, to Floyd E. Stein, The Babbitt Rd., $100,000.

Pennsylvania—State Hy. Dpt., Harrisburg, grading, drainage structures 7.424 sq.yd. Route 442, Lancaster Co., to D. L. Risser, Lebanon, $56,250. Noted Oct. 15.

Pa., Phila.—Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., grading Jackson St. from 75th to 78th Sts., Vance St. from 82nd to 85th Sts., and 82nd St. from Island to Vance Sts., to T. P. Lee, 5629 Cherry St., $4,402—Whitaker St. from Cayuga to Winchester Sts., to F. Feraco, 3632 North Lawrence St., $1,739—asphalt paving (assessment work) Bigler St. from 10th to Marvine Sts., and Hunting Park Ave. from K to M Sts., to Union Paving Co., Broad and Stiles Sts., $6,335 and $16,800 respectively—paving and repaving alleys and driveways, to D. Cecchini, 311 North 65th St., $12,593. Grand total $40,310. Noted Oct. 22.

Pa., Pittsburgh—See "Bridges."

Tenn., Memphis—Concrete paving 2,057 sq.yd. Emmason St., to V. E. Schevenell Constr. Co., 1780 Walker Ave., $16,463; 2,550 sq.yd. Simpson Ave., to F. S. Neely, 669 Maury St., $34,632.

Tex., Fort Worth—City, 2½ in. vertical fiber brick on 6 in. reinforced. paving South Main St.-Underpass, to West Texas Constr. Co., 501 East Rosedale St., $26,702.

Virginia—State Hy. Dpt., Richmond, clearing, grubbing, grading, drainage structures 5.2 mi. road in Appomattox Co., incl. bridge over west fork Bent Creek, to L. M. Hutchinson, Orbisonia, Pa., $31,562—1 mi. Madison Co., to Rhoads & Walters, Culpeper, $8,222—0.8 mi. Northumberland Co., to Perkins-Barnes Constr. Co., Blackstone, $4,729—1944 ft. bridge over puddle fork Bent Creek, to L. M. Hutchinson, Orbisonia, Peabody Constr. Co., Charlotte, N. C., $12,3024. Grand total $56,434. Noted Oct. 1.

Wash., Seattle—Bd. P. Wks., concrete paving 27th Ave. N. et al., to Moeert Bros., 2025 Jackson St., $32,035.

Ontario — Dpt. Hys., Parliament Bldgs., Toronto, A. A. Smith, ch. engr., grading, ditching, concrete culverts, concrete bridges, filling, widening 3.1 mi. Yonge St., Toronto city limits, northerly, Contr. 31-66, to A. E. Jupp Constr. Co., 170 Berkeley St., Toronto—4.1 mi. Alexandria northerly, Contr. 31-67, to Edgar Irving Co., Ltd., Alexandria—0.4 mi. Fonthill diversion, Contr. 31-68, to R. F. Booth, Niagara Falls. Est. $60,000.

Ont., Toronto—York Twp., curbing and guttering bituithine paving Riverview Gardens and Dundas St., to Warren Bituminous Paving Co., 74 University Ave., $10,075 and $34,415 respectively.

Ont., Toronto—Asphalt paving Bloor St. to Law Constr. Co., Ltd., 225 Sterling Rd., $24,152; asphalt and brick block paving St. Clair Ave., to Godson Contg. Co., Ltd., 2064 Richmond St. W., $5,864. Est. $40,000.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Calif., Modesto—See "Waterworks."

Iowa — State Game & Fish Comn., Des Moines, 9,000 ft. artificial lake, incl. concrete dam, spillway, in Albia and Blakesburg, $75,000, Brown Eng. Co., Ottumwa, consult. engrs.

Tex., San Antonio—City, c/o C. M. Chambers, mayor, eliminating bend in river between 8th and 10th Sts., cutting through new river bed on straight line, dirt excavated will probably be dumped on old river bed, part of flood prevention in San Antonio River, $150,000. J. Ewig, c/o City Hall, engr.

Ont., Brampton—Town, ½ mi. cut-off and diversion of Etobicoke River, incl. 46,000 cu.yd. earth excav., 5,000 cu.yd. concrete in walls, 2 span reinforced-con. bridge, $60,000. D. T. Black, Brampton, engr.

Ont., Toronto — City, new wooden docks, dredging at Hanlan's Point, Toronto Islands $104,000. J. G. R. Wainwright, Harbor Bldg., engr.

Ont., Toronto—See "Sports and Parks."

BIDS ASKED

Ill., Galesburg—See "Sewers."

Ia., Sioux City—See "Contracts Awarded."

CONTRACTS AWARDED

Ia., Sioux City—City Council, straightening Perry Creek, day labor, $100,000. L. Hintgen, City Hall, engr. Noted Oct. 15.

La., New Orleans—State Bd. Engineers, constructing Montgomery Ferry South New Levee, Nineteenth Louisiana Levee Dist., 30,600 ft. long, 170,000 cu.yd. excav., on west bank Red River, Natchitoches Parish, to J. I. McWilliams, New Orleans, at $0.0844 per cu.yd. Sample-Westdale Levee in Red River-Bayou Pierre Levee & Drainage Dist., Red River Parish, to J. J. McKeithen, Grayson, $0.0847. Noted Oct. 1.

Mass., Boston—Metropolitan Dist. Comn., Parks Div., widening, extending Boston Embankment, incl. 725,000 cu.yd. filling in Charles

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Excavation, Drainage, Irrigation, Levees (Cont.)

River Basin, 1,050 cu.yd. rein.-cement concrete masonry, to Trimount Dredging Co., 10 State St., Boston, $273,683. Noted Oct. 1, under "Streets and Roads."

Alta., Calgary—City, earth embankment on end new reservoir, to F. Mannix, Calgary, $35,400.

Ont., Riverside — East Marsh Drain, to Chatham Dredging Co., 96 King St. W., Chatham, $38,750 cofferdam, to Peltier Co., 240 Matthew Brady Blvd., $2,425.

Bond Elections

Coming Bond Elections

Mountain Water Supply System—Sacramento, Calif., Dec. 16 (tentative date), $12,600,000. A. Gwaim, 2175 35th St., engr.

Waterworks Impvts.—Charleston, Ill., $84,000.

Water System — Burlington, Wash., Dec. 8, $40,000.

Sewers and Water Systems — Willcox, Ariz., $100,000. A. A. Weiland Eng. Co., Pueblo, engr.

Sewerage System—Laguna Beach, Calif., Nov. 30, $180,000. Currie Eng. Co., San Bernardino, engr.

Sedimentation Plant—Palo Alto, Calif., J. F. Byxbee, city engr.

Drainage — Amite, La., Tangipahoa Parish Gravity Drainage Dist. No. 3, Nov. 24, $60,000.

Hydro Electric Plant — Coeur d'Alene, Idaho, $650,000. F. R. Ward, engr.

Municipal Building — Rye, N. Y., Dec. 2, $250,000.

Bonds Voted

Reservoir, Pipe Lines, Filter Plant Ext., etc.—Hartford, Conn., Metropolitan Dist. Water Comm., $8,600,000. C. Saville, 1926 Main St., engr.

Waterworks—Mankato, Kan., $60,000.

Waterworks—Princeton, Mo., $35,000. C. A. Haskins, Kansas City, engr.

Sanitary and Storm Sewers—Ponca City, Okla., $40,000. C. E. Hicks, Ponca City, engr.

Drainage Impvts.—Donaldsonville, La., $35,000.

Power Plant—Starkville, Miss., $102,000.

Light and Power Plant—Eaton, O., $233,000.

Light and Power Plant—Piqua, O., $810,000. W. G. Whitney, city mgr.

Municipal Golf Course—Pacific Grove, Calif., $40,000.

Bonds Defeated

Waterworks Ext.—Kenner, La., East Jefferson Waterworks Dist., $300,000.

Filtration Plant—Jamestown, N. D. $80,000.

Waterworks Ext.—Storm and Sanitary Sewers, Canton, O. $566,000.

Water Supply—Shawnee, Okla., $200,000.

Sewage Disposal Plant — Bowling Green, O. $280,000.

Sanitary Sewers—Delaware, O., $150,000.

Sewage Disposal Plant and Sewers—Van Wert, O. $500,000.

Sanitary Sewerage System—Washington Court House, O. $150,000.

Garbage Incinerator—Kenosha, Wis. $95,000.

State Institutions, Rebuilding and Rehabilitating—Ohio, $7,500,000.

Senior High School—Conneaut, O. $150,000.

Northridge School Add.—Dayton, O. $170,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., March Field—GYMNASIUM—THEATRE—Con. Q.M. rejected bids Oct. 13, constructing, completing gymnasium-theatre. Noted Sept. 17.

Calif., Marysville—POST OFFICE — Treas. Dpt. at office Sup. Archt., plans by J. J. Donovan, 1916 Bway., Oakland, U. S. Post Office.

Calif., Sacramento—DREDGING—U. S. Eng., 6,570,400 cu.yd. in San Joaquin River.

Fla., Clearwater—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by T. Skinner, 504 Haven St., U. S. Post Office, $150,000.

Fla., Sarasota—FEDERAL—Treas. Dpt. at office Sup. Archt., plans by A. Freeman & H. Hall, Sarasota, U. S. Post Office. Noted Jan. 1.

Ill., Cairo—PILING DIKES—U. S. Eng., St. Louis, Mo., 4,000 lin.ft. piling dikes at Crain Island and Rockwood, in Mississippi River, 106 mi. above here.

Ind., Plymouth—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by J. H. Wildermuth, 673 Bway., Gary, rein.-con., stone, brick. Noted Oct. 22.

Ia., Knoxville—WATER SOFTENING PLANT—Vet. Bu., Arlington Bldg., Wash., D. C., rejected bids Oct. 6, zeolite water softening plant. Noted Sept. 24.

La., Shreveport—FIRE STATION, etc.—Con. Q. M., Barksdale Field, rejected bids Sept. 28, 2 story, basement, 42 x 49 ft. fire station and 32 x 143 ft. guard house, at Barksdale Field, $47,000. Will readvertise. Noted Sept. 3.

Minn., Fergus Falls—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids 2 story, basement, rein-con., brick, $150,000

N. Y., New York—DREDGING—U. S. Eng., Army Bldg., Whitehall St., 59,530 cu.yd. ledge rock and 15,500 cu.yd. other than rock from Middle Ground Sect., East River.

N. Y., Schenectady—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by J. M. Ryder, 122 Jay St., Schenectady, and McKim, Meade & White, assoc. archts., 101 Park Ave., New York, U. S. Post Office.

Pa., New Castle—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by W. G. Eckles Co., 719 Law Savings & Trust Bldg., 1 story, basement, brick, steel Washington, Jefferson, Market and Diamond Sts. $525,000. Noted Oct. 15.

Tex., San Antonio—QUARTERS, etc.—War Dpt., Wash., D. C., officers quarters, cadet barracks, hangars for 3rd Flying Unit, at either Randolph or Kelly Fields, $4,000,000; also sketches officers quarters, Argonne Heights, $2,000,000.

Tex., San Antonio—STATION PLANT—Dpt. Commerce, Wash., D. C., 2000 watt station plant for issuing weather reports, incl. huge beacon light. $75,000.

Tex., Tyler—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by S. D. Porter, Federal Bldg., Dallas, 2 or 3 story, rein.-con., brick federal post office. $350,000. Noted Nov. 5.

Utah, Salt Lake City—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Scott & Welch, Dooly Bldg., U. S. Post Office.

Vt., Highgate Springs—STATION — Treas. Dpt. at office Sup. Archt., Wash., D. C., sketches border station. Private plans.

Va., Langley Field—FUEL OIL TANK, etc.—Con. Q.M. rejected bids Sept. 23, 50,000 gal. concrete, fuel oil tank, boiler plant, outside distribution system. Noted Sept. 10.

BIDS ASKED

Alabama and Mississippi—DREDGING—See "Contracts Awarded."

Ala., Montgomery—POST OFFICE—Dec. 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office, $1,000,000. F. Lockwood, 119 Adams St, Montgomery, archt. Noted Apr. 16.

Calif., Alameda—EXTENDING, etc.—Dec. 4, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending, remodeling U. S. Post Office; adv. E. N.-R. Nov. 12.

Calif., Stockton—POST OFFICE—Dec. 8, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $695,000. Noted Mar. 19.

Fla., St. Petersburg — HOME — Vet. Bu., Arlington Bldg., Wash., D. C., bids about Dec. 1, (1st unit) soldiers home, consisting 5 story hospital, 3 story barracks, warehouse, garage, $900,000.

Idaho, Boise—TANK, etc.—Nov. 24, by Superv. Supt. Constr., U. S. Veterans Hospitals, Palo Alto, Calif., 1 aerating tank, pump house, pumps, piping, one 30,000 gal. wood stave tank with aerating device, installing deep well and 2 horizontal direct connected motor driven booster pumps, 2 chlorinators, at Veterans Hospital.

Ind., Greensburg—POST OFFICE—Dec. 2, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Nov. 12. Noted Feb. 19.

Ind., Indianapolis—REMODELING—Nov. 18, by Treas. Dpt. at office Sup. Archt., remodeling and enlarging Finance Div.

Kan. Leavenworth—PILE CLUMP DIKES—Nov. 27, by U. S. Eng., 700 Postal Telegraph Bldg., Kansas City, Mo., 12,570 lin.ft. standard pile clump dikes or single pile dikes in Missouri River at Delaware Bend, center of work being 6 mi. downstream from here.

La. New Orleans—REVETMENT—Nov. 17, by U. S. Eng., foot Prytania St., 15,031 lin.ft. wooden revetment levees in 2nd New Orleans Levee Dist.

Mass., Andover—POST OFFICE—Nov. 20, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Nov. 5.

Mass., Hingham—HEATING SYSTEM—Nov. 20, by Dist. P. Wks., Navy Yard, Boston, furnishing, installing air heating system, incl. electric heater units, concrete pit, at Naval Ammunition Depot.

Mich., Sturgis—POST OFFICE—Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $125,000

Miss., Biloxi—SOLDIERS HOME—Dec. 8, by Vet. Bu., Arlington Bldg., Wash., D. C., new buildings, utilities at Soldiers' Home. $1,000,000; adv. E. N.-R. Nov. 12. Noted May 7.

Miss., Meridian—POST OFFICE, etc.—Dec. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., 3 story, basement, brick post office, court house, 9th St. between 21st and 22nd Sts. $550,000. P. J. Krouse, 505 M. and W. Bldg., and F. A. Fort, 1309 24th Ave., assoc. archts. Noted May 28.

Missouri—PILING DIKES—Nov. 17, by U. S. Eng., 428 Custom House, St. Louis, 3,000 ft. piling dikes in Washington Reach, Missouri River; 3,500 ft. at Augusta Bend; 2,200 ft. Marthasville Reach; 4,500 ft. South Point Reach; 2,300 ft. Howard Bend; adv. E. N.-R. Nov. 12.

Mo., St. Louis—FOUNDATION—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids about Dec. 20, found. for 10 story, basement, 213 x 257 ft., rein.-con., stone federal building, 12th and Market Sts. Maurin, Russel & Crowell, Chemical Bldg., archts. Noted Oct. 1.

N. J., Lake Denmark—SHELL HOUSE, etc.—Nov. 18, by Yards & Docks, Navy Dpt., Wash., D. C., 1 story, 50 x 200 ft. shell house and 1 story, 50 x 100 ft. magazine, Naval Ammunition Depot. $150,000. Private plans.

N. Y., Wellsville—POST OFFICE—Nov. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office.

Pa., Pittsburgh—POST OFFICE, etc.—Dec. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., superstructure U. S. Post Office, Court House; adv. E. N.-R. Nov. 12. Noted Dec. 25.

Pa., Uniontown—POST OFFICE—Dec. 4, by Treas. Dpt. at office Sup. Archt., demolishing old buildings and constructing U. S. Post Office; adv. E. N.-R. Nov. 12. Noted Apr. 16.

R. I., Melville—TANK—Spec. 6681—Nov. 1[8] by Yards & Docks, Navy Dpt., Wash., D. [C] 90,000 gal. steel tank at Naval Fuel Depot.

Tex., Galveston — FEDERAL BUILDING — Nov. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Federal Building.

Va., Norfolk—RIP RAP STONE—Dec. 4, [by] U. S. Eng., Norfolk, 2,500 short tons rip rap stone for repairing Craney Island bulkhead, Norfolk Harbor; adv. E. N.-R. Nov. 12.

CONTRACTS AWARDED

Alabama and Mississippi—DREDGING—[Con.] Q. M., Mobile, Ala., 3,400,000 cu.yd. Gulfport Ship Channel and Anchorage Basin in Mississippi, by own plant and hired labor. Former bids rejected. Noted Sept. 10.

Ala., Montgomery—FUELING SYSTEM—[Con.] Q. M., Maxwell Field, underground fueling system for airplanes, to Aqua Systems, Inc., [2] Lafayette St., New York, $9,437. Noted Sept. [3]

Calif., Stockton—DREDGING—U. S. Eng., California Fruit Bldg., Sacramento, 1,289,000 cu.yd. Stockton Channel, San Joaquin River, to Hydraulic Dredging Co., Central Bank Bldg., Oakland, $159,578. Noted Oct. 1.

Conn., Waterbury—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., rein.-con., brick, stone, to Murch Bros. Constr. Co., Railway Exch. Bldg., St. Louis, Mo., $352,000. Noted Oct. 15.

Del., Georgetown — POST OFFICE — Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Gernet Ryan Co., 1700 Walnut St., Phila., Pa. $45,982. Noted Oct. 22.

D. C., Wash.—EXCAVATION, etc.—Treas. Dpt. at office Sup. Archt., Wash., D. C., excavation and founds. for U. S. Post Office Dpt. Building, to McCloskey & Co., 1620 Thompson St., Phila., Pa., $686,000. Noted Sept. 17.

D. C., Wash.—STORAGE—U. S. Eng., 1068 Navy Bldg., 1 steel storage and 1 steel shop buildings, to Blaw Knox Co., Pittsburgh, Pa., $17,940; founds., floors, to E. E. Ward & Sons, 3563 11th St. N. W., $12,460. Noted Oct. 15.

Florida—DREDGING—U. S. Eng., Jacksonville, 525,000 cu.yd. material from intracoastal waterway near Matanzas Inlet, to Clark Dredging Co., 345 Southwest North River Dr., Miami, at $0.082 per cu.yd. Noted Oct. 6.

Idaho, Boise—DISTRIBUTING SYSTEM—Vet. Bu., Arlington Bldg., Wash., D. C., outside steam distributing system for U. S. Veterans' Hospital, to Lessinger Plumbing & Heating Co., Boise, $20,803; two 100 hp. boilers, to Connor & Ripsta, 1015 East Douglas St., Wichita, Kan., $10,988. Noted Sept. 24.

Ind., Auburn—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to LaSalle Constr. Co., South Bend, Ind., $51,400. Noted Oct. 8.

Kan., Emporia—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to Wickes Eng. Co., 1441 Bluff St., Des Moines, Ia., $22,428. Noted Oct. 8.

La., New Orleans — EARTHWORK — U. S. Eng., Prytania and River Sts., 270,000 cu.yd. earthwork in 2nd New Orleans Levee Dist., to J. L. McWilliams, New Orleans Bank Bldg. Noted Oct. 22.

Mich., Detroit—POST OFFICE—Treas. Dpt. at office Sup. Archt., wrecking present building, constructing concrete caisson found. for U. S. Post Office, to Walbridge-Aldinger Co., 1300 Buhl Bldg. Total est. $5,565,000. Noted Oct. 1.

Mississippi—EARTHWORK—U. S. Eng., P. O. Box 667, Vicksburg, 40,600 cu.yd. earthwork on east bank Mississippi River, to Noble & Croxton, Fayette, at $0.18 per cu.yd. Noted Oct. 8.

New Mexico — ROAD — Pub. Rds. Denver, Colo., grading 12 mi. road between Nogal and Capitan, to T. L. Green, 11 North Lee St., Oklahoma City, Okla., $140,022.

N. Y., Medina—POST OFFICE—Treas. Dpt. at office Sup. Archt. Wash., D. C., post office to David Gordon Building & Constr. Co., 353 Rockdale Ave., Cincinnati, O., $59,746. Noted Oct. 1.

N. Y., New York — APARTMENT — Con. Q. M., 4 story, 40 x 300 ft. non-commissioned officers apartment, Fort Jay, to Longacre Eng. & Constr. Co., 345 Madison Ave., $381,000. This corrects report in Oct. 22 issue.

N. Y., New York—DREDGING—U. S. Eng., Army Bldg., 39 Whitehall St., 304,350 cu.yd. Westchester Creek, to Arundel Corp., Pier 2, Baltimore, Md., at $0.1938 per cu.yd., total $58,984. Noted Sept. 17.

N. C., Oteen—HOSPITAL—Vet. Bu., Arlington Bldg., Wash., D. C., ward building and quarters for U. S. Veterans' Hospital, to H. R. Ryan Co., 510 North Dearborn St., Chicago, Ill., $538,000. Noted Feb. 5.

North Dakota—REVETMENT—U. S. Eng., 707 Postal Telegraph Bldg., Kansas City, Mo., 3,000 lin.ft. standard revetment in Missouri River, at Mannhaven Bend, 2 mi. south of Fort Berthold Indian Reservation, to I. Bourgois, Bismarck. Noted Sept. 25.

O., Niles—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., post office, to Yuhasz & Olson, Gary, Ind., $83,746. Noted Oct. 1.

Pa., Altoona—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to R. B. McDanel Co., New Brighton, Pa., $319,900; elevator, to American Elevator Co., 500 East Main St., Louisville, Ky., $23,489. Noted Oct. 15.

Pa., Phila.—FOUNDATIONS—Treas. Dpt. at office Sup. Archt., Wash., D. C. founds. post office, to Gow Co., Inc., 90 West St., New York, $247,740. Noted Oct. 15 Daily.

Tenn., Memphis—EARTHWORK—U. S. Eng., 75,000 cu.yd. earthwork in Upper Yazoo Levee Dist., to H. A. Worman, Pittsfield, Ill., at $0.193 per cu.yd.; 7,800 cu.yd. near Moon

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Federal (Continued)

Landing, Upper Yazoo Levee Dist., to J. Anderson, Bellow, $2,106. Noted Oct. 2 Daily.

Tenn., Memphis—PONTONS—U. S. Eng., 8 dredge pontons, to Stacy Mfg. Co., 5535 Carthage Park, Elmwood, Cincinnati, O., $11,370; eight sections 36 in. steel dredge pipe and 1 home joint section steel dredge pipe, to Chicago Bridge & Iron Wks., Birmingham, Ala., $2,434.

Tex., Memphis—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., post office, to Landis & Young, Bloomington, Ind., $51,900. Noted Oct. 1.

Wash., American Lake — HOSPITAL — Vet. Bu., Arlington Bldg., Wash., D. C., continued treatment hospital, walks, sewers, waterworks, and electrical distribution system at U. S. Veteran's Hospital, to Western Constr. Co., Seaboard Bldg., Seattle, $247,770. Noted Oct. 1.

Ont., Ottawa — OFFICE — Foreign Service Buildings Office, State Dpt., Wash., D. C., 3 story, penthouse, store, to George A. Fuller Co., 597 Madison Ave., New York, $299,800. Noted Oct. 15.

T. H., Wheeler Field — HANGARS — Con. Q. M., Fort Shafter, Honolulu, 4 air corps double hangars, 1 machine shop, 1 assembly shop, 1 warehouse, to K. Colburn, Inc., 385 East Green St., Pasadena, Calif., $279,000. Noted Sept. 24.

RAILWAYS

PROPOSED WORK

Ontario—Standard Chemical Co., South River, 3 mi. new railway to connect new timber limit in Paxton Twp. with company's other lines in South River. Private plans. $175,000.

BIDS ASKED

New Jersey—Dec. 11, at office J. T. Congleton, dir. Dpt. P. Affairs, City Hall, Newark, portion City Railway, known as Sect. 2, in bed Morris Canal, from Washington St. to Raymond Plaza West, in Newark; adv. E. N.-R. Nov. 12.

CONTRACTS AWARDED

New York—Albany Port District Comm., 74 Chapel St., Albany, 8 mi. track, Albany, to Morrison Railway Supply Co., 25 East Huron St., Buffalo, $209,201.

New York—Dpt. Mental Hygiene, State Office Bldg., Albany, railroad track and trestle at Pilgrim State Hospital, Brentwood, to Woodcrest Constr. Co., 5840 Grand Central Terminal, New York, $70,635. Noted Sept. 10.

GRADE CROSSINGS

PROPOSED WORK

California—Cities of Long Beach and Signal Hill, Los Angeles Co. (Los Angeles) and Pacific Ry. Co., Pacific Electric Bldg., Los Angeles, E. C. Johnson, ch. engr., soon takes bids grade separation over Pacific Electric Ry. at Hill St. and Orange Ave. in Long Beach. $140,000. A. H. Adams, City Hall, Long Beach, engr.

N. Y., Adams—New York Central R.R. Co., F. B. Freeman, ch. engr., 416 Lexington Ave., New York, soon takes bids eliminating Phelps St. and Church St. crossings. $124,400. Noted Jan. 9.

N. Y., Essex—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, soon takes bids eliminating Cooks Crossing on Whallonsburg-Essex Ry., 2 mi. south of here. $111,200.

N. Y., Henrietta — Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating Cedar Swamp Grade crossing. To exceed $40,000.

N. Y., Paris—Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, soon takes bids bridge in connection with elimination Main St. and Plank Rd. crossings. $92,400.

Alta., Calgary — Ratepayers voting early in December on bylaw for construction subway from 9th to 10th Aves. at 4th St. under Canadian Pacific Ry. Est. $150,000. A. S. Chapman, city engr.

B. C., New Westminster—City, constructing Columbia St. division and grade separation. It is planned to carry this out under unemployment relief scheme of city, largely by day labor. $122,000. H. Stewardson, City Hall, engr.

Ont., Franktown—See "Bridges."

Ont., Toronto—City and Canadian National Ry., T. T. Irving, ch. engr. (Central Region), Toronto, subway, concrete or steel spans, concrete retaining walls, under Canadian National Ry. tracks, at Lovan Ave. $150,000. R. C. Harris, City Hall, engr.

Ont., Toronto—City, Scarboro and East York Twps. and Canadian Natl. Rys., Montreal, Que., C. S. Gzowski, ch. engr., 400 ft. subway, 66 ft. wide, steel spans, concrete piers, retaining walls, under tracks at Victoria Park Ave. $150,000. E. M. Baird, 1836 Kingston Rd., Scraboro Twp., engr.

BIDS ASKED

N. Y., Pelham—Nov. 24, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, stone faced structural steel, rein.-con. overcrossing, on Hutchinson River Parkway, at Boston Post Rd. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Nov. 12.

CONTRACTS AWARDED

N. Y., Erwin—Erie R.R. Co., R. C. Falconer, ch. engr., 101 Prospect Ave. S. W., Cleveland, O., eliminating Kelley Crossing, to Industrial Constr. Co., c/o owner, $55,484; structural steel, to Pittsburgh-Des Moines Steel Co., 270 Bway., New York, $26,517.

N. Y., Hempstead — Long Island R.R. Co., A. D. Watson, ch. engr., Pennsylvania Sta., New York, reconstructing bridge carrying tracks over Jericho Turnpike, to Foley Bros., Inc., 117 Liberty St., New York. Noted Aug. 6.

N. Y., Westport—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating Oak Point Crossing, to Kingsbury Constr. Co., Hudson Falls, $49,522.

Tex., Houston — City, c/o W. E. Monteith, mayor, rein.-con., concrete underpass on 75th St. extension, to J. B. Dannenbaum, Bankers Mortgage Bldg., $24,700. Est. $27,500.

Wisconsin — State Hy. and Unemployment Comns., Sterling Overhead, Washington Co. and Schultz Overhead, Columbia Co., to F. D. Hayes Co., Janesville, $39,866 and $25,440 respectively; Eland Junction Overhead, Shawano Co., to C. R. Meyer & Sons, Oshkosh, $11,847; Darien Subway, Walworth Co., to Kopplin & Williams, Green Lake, $17,163; Appleton Subway, Outagamie Co., to Dieckmann Constr. Co., Kiel, $25,101; Shawano Ave. Grade Separation, Brown Co., to F. Van Nelson, Green Bay, $41,991; Husher Grade Separation, Racine Co., to Roger Van Vechten, Wauwatosa, $16,716; Roberts Overhead, St. Croix Co., to J. E. Hinmann & Son, Glenwood City, $21,231; East Forest Junction Overhead, Calumet Co., to J. C. Basten, Green Bay, $15,319. Grand total $214,694. Noted Oct. 29.

DAMS

PROPOSED WORK

New Hampshire—Public Serv. Co. of New Hampshire, A. R. Schiller vice-pres., raising dam 21 ft. and building 8 ft. flash boards, Pemigewasset River, Bristol and New Hampton, $850,000. L. J. Farrell, Elm St., Manchester, engr.

Pa., Chambersburg—See "Waterworks."

PIERS AND WHARVES

BIDS ASKED

N. Y., Brooklyn—PIER, etc.—Nov. 20, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, constructing pile and timber work for new pier, concrete deck, pier shed and appurtenances, removing existing pier, dredging foot Cranbury St., Agreement "GA."

CONTRACTS AWARDED

Que., Levis — PIER — City, M. Lebland, mayor, pier on Canadian Natl. Railroad grounds, to Northern Logging & Contracting Co. Ltd., 190 St. Paul St., Quebec, $35,000.

AIRPORTS

PROPOSED WORK

Pa., Pittsburgh—Allegheny Co., R. G. Woodside, controller, expending $88,250, installing radio control, fire fighting, other systems at airport.

BIDS ASKED

Conn., East Haven (br. New Haven)—Viking Flying Boat Co., c/o M. Linenthal, engr., 250 Devonshire St., Boston, Mass., taking bids 1 and 2 story, 25 x 100 ft. shop and office, steel, and 85 x 100 ft. airplane hangar, steel, tile, stucco.

Okla., Oklahoma City—Nov. 24, by M. Peshek, Jr., city clk., new airport hangar, $75,000. A. R. Losh, City Hall, engr.

POWER AND LIGHTING

PROPOSED WORK

New York—New York Central Electric Corp., 89 East Ave., Rochester, electric distribution system in Troupsburg and Jasper.

N. Y., Howard—See "Factories and Mills."

N. Y., Turin—Northern New York Utilities Co., 58 Public Sq., Watertown, electric distribution system additions, here and in West Turin.

Okla., Oklahoma City—City defeated franchise to Oklahoma Natural Gas Co., 112 North Bway., for natural gas system. Private plans. C. J. Blims, mayor. Noted Aug. 6.

Texas—See "Power Plants."

BIDS ASKED

Ill., Evanston — City, bids after Nov. 5, ornamental street lighting system. $1,438,000. Former bids rejected. Noted Dec. 11. R. Loag, city engr.

N. Y., New York—Nov. 19, by Bd. Higher Educ., at office Secretary Hunter College, Park Ave., and 68th St., illuminating fixtures for Instruction Unit 2, and Power House-Cafeteria—Social Unit, for Hunter College of City of New York, Bedford Park Blvd., South Jerome, Navy, and Goulden Aves.

N. Y., New York—Nov. 19, by E. P. Mulrooney, police comr., 240 Center St., installing traffic signal posts, lanterns, control boxes, subsidiary pipe along Bway. from 14th to 72nd Sts., and lead covered cable along Bway. from Rector to 72nd Sts.; traffic signal posts, lanterns, control boxes, subsidiary, pipe and lead covered cable on Madison Ave. between 23rd and 73rd Sts., all above Manhattan Boro., traffic signal posts, lantern and subsidiary pipe traffic control equipment attached to elevated structure and installing underground cable along Bridge Plaza from Crescent St. to Northern Blvd., Queens Boro.

Tex., Wellington—Nov. 16, by City, natural gas system, incl. 40,000 ft. 2- to 6-in. pipe, booster plant, etc. $75,000. Private plans. Noted Oct. 15.

Tex., Wichita Falls—City taking bids erection of, operating and maintaining natural gas system. $1,000,000 or more. Address W. Nelson, Jr., Mayor.

PARKS AND SPORTS

PROPOSED WORK

Me., Portland—City, swimming pool, rear of Deering High School, Stevens Ave. $25,000. J. E. Barlow, City Hall, engr.

N. Y., Brooklyn—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, rejected bids Oct. 13, altering standpipe system at Brooklyn Institute of Arts and Sciences, Eastern Parkway and Washington Ave. Noted Oct. 8.

N. Y., Dongan Hills (sta. Staten Island)—Dpt. Parks, W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park New York, purchased 20 acre site and plans park at Forest Hills and Richmond Hill Rds. To exceed $100,000.

N. Y., New York—S. Levy, pres. Manhattan Boro. Municipal Bldg., plans by C. B. Meyers, 31 Union Sq., 75 x 100 ft. public baths, 165 East 120th St. $450,000.

Tex., Port Arthur—City, c/o P. G. Crook, park comr., park improvement, incl. developing 15 acres, constructing 400,000 gal. Buntz type swimming pool, grade and fill, erecting comfort stations. W. J. Gray, Port Arthur, engr.

Ont., Toronto—City, 11 mi. aquatic course, incl. partially closing up present breakwater openings, establishing 3,000 ft. area, concrete seats, 10,000 seating capacity. $280,000. R. C. Harris, City Hall, engr.

BIDS ASKED

Ill., East St. Louis—See "Contracts Awarded."

N. Y., Long Island City—Nov. 17, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, reconstructing golf links, Forest Park, walks, curbing, improving Rose and Oak Aves., at entrance Kissena Park.

N. Y., Port Richmond—Nov. 17, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, swimming pool, children's wading pool, bathhouse, recreational building, Faber Park, former bids rejected, excavating grading asphalt mastic walk, playground apparatus, vitr. tile pipe, electric light ducts and lights, Faber Park, Richmond Boro.

CONTRACTS AWARDED

Calif., San Diego—See "Unclassified."

Ill., East St. Louis — East St. Louis Park Dist., 929 Missouri Ave., park development, incl. grading, planting trees and shrubbery, widening roads, 275 acres reclaimed land in Lake Park, day labor. E. P. Griffith, c/o owner, engr.

Tenn., Nashville—See "Schools."

HEATING AND VENTILATING

PROPOSED WORK

N. Y., New York—Jones Jewell Milling Co., 88 Lexington Ave., heating, lighting, water supply in warehouse for use as lodging house, $40,000. Lockwood, Greene & Co., 100 East 42nd St., New York, archts.

BIDS ASKED

Mass., Norfolk—Nov. 25, by Dpt. Correction, Turnishing, erecting new boilers, stokers, forced draft equipment, smoke pipe and coal and ash handling equipment at State Prison Colony.

Pa., Phila.—Nov. 17, by Dpt. City Transit, C. E. Myers, dir., City Hall Annex, alterations heating system for east side of City Hall, Contr. 255.

CONTRACTS AWARDED

Mass., Monson—W. A. Merrill, State House, Boston, 3 boilers for heating plant, for Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, to Erie City Iron Wks., 25 Huntington Ave., Boston, $17,100; 3 stokers, to Westinghouse Electric & Mfg. Co., 10 High St., Boston, $9,000. Noted July 9.

N. Y., Jamaica—Bd. Educ., 500 Park Ave., New York, heating P. S. 117, to D. J. Rice, 41-50 38th St., Long Island City, $28,200; plumbing, to Lossack Gaynor Corp., 119 Prospect St., Long Island City, $10,260; lighting and fixtures to S. W. Hurowitz, Inc., 205 East 42nd St., New York, $8,343. Grand total $46,803. Noted Sept. 24.

Wis., Oshkosh — Bd. Educ., heating Junior High School, to Stoehr & Loudon, 625 60th St., Milwaukee, $32,644; plumbing, to Downey Plumbing Co., $14,900; electrical work, to A. H. Meyer Co., Oshkosh, $7,846. Grand total $55,486. Noted Oct. 15, under "Schools."

UNCLASSIFIED

PROPOSED WORK

N. J., Morristown—ENCLOSURE—Bd. Town Council, Town Hall, preliminary plans and bids about January, enclosing Corey's Brook from Atno Ave. to Washington St. by constructing either cement lined ditch or terra cotta pipe. $50,000. C. K. Fetzler, South St., engr.

N. Y., New York—SCALE BOX—Cullen Fuel Co., 192 Lexington Ave., plans by Nicholson

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Unclassified (Continued)

Co., 405 Lexington Ave., 2 story, 30 x 100 ft., scale box and office, coal yard, Ferris Pl. and Kirk St. $40,000.

N. Y., New York—TELEPHONE IMPROVEMENTS—New York Telephone Co., 140 West St., expending $3,817,000, for construction, incl. equipping 3 dial offices and underground cable.

O., Cleveland—GRADING, LANDSCAPING, etc.—Bd. Educ., ground improvements, incl. grading, landscaping, walks, retaining walls and fence at new South High John Marshall and James Ford Rhodes Schools. To exceed $100,000. G. M. Hopkinson, East 6th and Rockwell Sts., engr.

O., Youngstown — DOCK — City, municipal dock or terminal at Mahoning River West Ave., where present filter plant of waterworks is located. Plan will be presented immediately to Army engineers for approval. $90,000. G. F. Turner, Youngstown, city engr.

Que., Quebec—FIREPROOFING—City, fireproofing city hall. $200,000.

BIDS ASKED

Calif., San Diego—TUNNELS—See "Contracts Awarded."

N. Y., Brooklyn—Nov. 17, by J. J. Dorman, fire comr., Municipal Bldg., New York, underground fire alarm system (incl. post, manhole, conduit and cable installation) in Stuyvesant and East New York Sections.

N. Y., Brooklyn—FINISH—Nov. 20, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, providing, installing finish for underground rectifier stations on Route 107, Sect. 6, Route 110, Sects. 1 to 4 (inclusive).

CONTRACTS AWARDED

Calif., San Diego—TUNNELS—City, several tunnels beneath streets adjacent to schools, also City Park improvements, force account, under supervision Park Comn. and City Manager. Election Dec. 15. $300,000, for same. H. W. Jorgensen, City Hall, engr.

Conn., Hartford—TANKS, etc. — Hartford Electric Light Co., 266 Pearl St., two 50,000 bbl. steel tanks, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston, Mass.; 15 x 20 ft. steel building, to Blaw Knox Co., Blaw Knox Bldg., Pittsburgh, Pa. Est. $30,000.

Mass., Brookline—ELECTRICAL WORK—Town, Bd. Selectmen, electrical work in school, Walnut St., to M. B. Foster, 514 Atlantic Ave., Boston. Est. $40,000. Noted Oct. 22, under "Schools."

Mass., Waverly—ELECTRIC DISTRIBUTION—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, electric distribution at W. E. Fernald State School, to H. M. Haley Electric Co., 165 Pearl St., Boston, $29,654.

Mich., Mt. Pleasant—PIPE LINE—Gas Corp. of Michigan, 11 mi. 4 in. steel pipe line from here to Vernon gas field, to Frick & Reed, Mt. Pleasant, $75,000.

New Jersey—PILE CYLINDER—State Hy. Dpt., Trenton, steel sheet pile cylinder around pivot pier of Passaic River swing bridge, Hudson and Essex Counties, to Simpson & Brown, 90 West St., New York. $13,900. Noted Oct. 22.

N. Y., Albany—DOCK, etc.—Albany Port Dist. Comn., Albany, dock extension to Tilt-Hargan Co., 90 West Bway., $104,612; transit shed, to H. G. Blessing, Albany, $148,940.

N. Y., Attica — REFRIGERATION — Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration at Attica Prison, to Carbondale Machine Co., Ellicott Sq., Buffalo, $43,936.

N. Y., New York—PLUMBING—Dpt. Hospitals, J. G. Greeff, comr., Municipal Bldg., plumbing alterations in Buildings 1, 3, 4, 5, 8, and 9, Riverside Hospital, to J. E. Kahn, 224 West 20th St., $17,575. Noted Oct. 22.

Pa., Phila. — RETAINING WALL — Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Pennsylvania Terminal Improvt., incl. retaining wall between Pennsylvania R.R. and Schuylkill Ave. west from Spring Garden St. southward to Frederick Snare Corp., 1524 Chestnut St., $611,533.

MATERIALS

BIDS ASKED

CAST IRON PIPE—**Arcadia, Calif.**—Nov. 19, by G. G. Meade, city clk., furnishing, delivering 2,500 ft. each 6 and 8 in. Class 150 or equal c.i. pipe.

WATER PIPE LINE—**Grass Valley, Calif.**—City Council taking bids furnishing 750 ft. 18 in. pipe line for waterworks.

FIR LUMBER — **Clarinda, Ia.** — Dec. 3, at office Auditor Page Co., 318,767 B.F. fir lumber, 15,460 lin.ft. creosoted yellow pine piling, 13,200 lb. nails, 250 gal. paint, 11,200 lin.ft. corrugated pipe. Address County Engineer or Auditor.

PIPE—**Minneapolis, Minn.**—Nov. 16, by F. S. Gram, city purch. agt., 2,000 lin.ft. 12 in. c.i. pipe. N. W. Elsberg, city engr.

WIRE—**Minneapolis, Minn.**—Nov. 17, by F. S. Gram, city purch. agt., 23 mi. No. 10 copper-clad weather-proof double, 40% conductivity, for police signal system. N. W. Elsberg, city engr.

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CHLORINE, etc.—**St. Paul, Minn.**—Nov. 17, by C. A. Carlson, city purch. agt., 25 tons liquid chlorine and 20 tons pig lead.

CEMENT, etc.—**Annandale, N. J.**—Nov. 20, by C. N. Leathem, Jr., state archt., Trenton, 3,400 bbl. cement, 14 tons brick sand, 1,125 tons air dried slag, for Cottage 7 and Administration Building, at New Jersey Reformatory, for Dpt. Institutions & Agencies, Trenton.

WIRE, ROPE, etc.—**New York, N. Y.**—Nov. 16, by M. F. Kenney, deputy and acting comr. Purchase, Municipal Bldg., wire rope, wire fencing and cloth, lumber and wood paving blocks to Dpts. Parks—Brooklyn, and Bronx, Plant & Structures, Water Supply, Gas & Electricity, Fire and Police Dpts.

STEEL SHEET PILING—**Houston, Tex.**—D. M. Duller, consult. engr., 1618 Second Natl. Bldg., taking bids steel sheet piling, based on 16 in. pile widths, 114 pieces 36 ft. long and 174 pieces 30 ft. long, f. o. b. cars Parker siding, Missouri Pacific Ry., near Engel St., Navigation Blvd., in connection 384 lin.ft. bulk-head wharf or dock on upper Houston Ship Channel, in fresh water, for Parker Bros. & Co., Inc., 1102 Holly St.

GRANITE CURBING—**Providence, R. I.**—Nov. 16, by Pub. Wks. Dpt., City Hall, 20,000 lin.ft. 7 in. granite curbing.

CONTRACTS AWARDED

CAST IRON PIPE—**Arcadia, Calif.**—City Council, to National Cast Iron Pipe Co., 210 4th Pl., Los Angeles, 6,500 ft. 12-in. c.i. pipe at $7.074 per ft., 76 ft. 14 in. $1.59, 100 ft. 10 in. $0.823, 224 ft. 4 in. $0.303.

CAST IRON PIPE — **Glendora, Calif.** — City Council, 6,500 lin.ft. 8 in. and 5,000 ft. 6 in. c.i. pipe, to American Cast Iron Pipe Co., 412 West 6th St., Los Angeles, $6,850. Noted Oct. 22.

SEWER PIPE, etc.—**Redlands, Calif.**—See "Sewers."

TREATED PILES — **New Orleans, La.** — Orleans Dock Bd., 380 untreated piles for Toulouse Street Wharf Extension, to Nola Lumber Co., Canal Bank Bldg., $5,469.

STEAM ASHES—**Long Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 16,000 cu.yd. steam ashes, to Empire Cinders Delivery Co., 26 Court St., Brooklyn, $19,040. Noted Oct. 15.

PORTLAND CEMENT—**New York, N. Y.**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 5,000 bags portland cement, to G. B. Raymond, 3062 Webster Ave., $2,106; 4,000 cu.yd. sand, grit, to Ames Building Material Co., 3441 Kingsbridge Ave., $9,000; 3,000 cu.yd. ¾ in. stone, to New York Trap Rock Co., 250 Park Ave., $8,340. Grand total $19,446. Noted Oct. 22.

CAST IRON PIPE, etc.—**Vancouver, B. C.**—City, to Gordon & Belyea Ltd., 101 Powell St., furnishing 1,000 ft. 4 in. Class D c.i. pipe, at $0.5923 per ft., 10,000 ft. 6 in. $0.847, 5,000 ft. 8 in. at $1.206, total $15,095; to Evans, Coleman & Evans, Ltd., foot of Columbia St., furnishing 20,000 ft. 6 in. centrifugal pipe, at $0.705 per ft., 10,000 ft. 8 in., $0.9812, total $23,912.

EQUIPMENT

PROPOSED WORK

FIRE ALARM EQUIPMENT—**Tulsa, Okla.**—City Comrs., E. Logan, aud., soon takes new bids furnishing, installing fire alarm equipment. $240,000. Former bids rejected, Smith & Senter, 307 Philtower Bldg., archts. Noted Oct. 8.

BIDS ASKED

POWER TRANSFORMERS—**San Francisco, Calif.**—Nov. 18, by S. J. Hester, secy. Bd. P. Wks., 3 electric power transformers to enlarge Seco Substation for pumping water through Carral Hollow Pipe Line, Hetch Hetchy Project.

PUMP—**Fairfield, Calif.**—L. Morrill, city clk., taking bids furnishing, installing pump in connection with waterworks.

BENDING BRAKE, etc.—**Detroit, Mich.**—J. Lewis, 1173 Dickerson Ave., in market 10 ft. 10 gage steel bending brake, arc welding machine.

OIL GEAR PUMP, etc.—**Detroit, Mich.**—Allied Die Cast Co. of America, 7420 Melville Ave., in market miscellaneous machine equipment for die casting shop, incl. oil gear pump.

CORPORATION COCKS, etc. — **New York, N. Y.** — Nov. 18, by Dpt. Purchase, Municipal Bldg., corporation cocks, hydrant and gate parks to Dpt. Water Supply, Gas & Electricity.

PUMPS—**New York, N. Y.**—Nov. 16, by Dpt. Purchase, Municipal Bldg., vacuum and boiler pumps to Dpt. Docks.

CONTRACTS AWARDED

VENTILATING FANS, etc.—**Boston, Mass.**—Transit Dpt., 1 Beacon St., furnishing ventilating fans and motors for traffic tunnel, Boston and East Boston, to Carlton-Mace Eng. Co., 254 Dover St., $68,200. Noted Oct. 29.

FOREIGN

Denmark — Dec. 5, by Danish State Rys. Copenhagen, electrification suburban lines. Plans available at Danish Legation, Wash., D. C.

Japan, Tokyo—Mitsubishi Co., Tokyo, plans 400,000 ton per year patent fuel manufacturing plant. $300,000.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Md., Baltimore—Nov. 15, by M. J. Nase archt., 14 East Lexington St., 6 story, basement, 45 x 110 ft., brick, cast stone, structural steel, York Rd., for York Apartment Co., c/o architect.

Md., Baltimore—See "Contracts Awarded."

N. J., Bayonne—See "Contracts Awarded."

N. J., Jersey City—See "Contracts Awarded."

N. J., Kearney (sta., Arlington) — Veron Constr. Co., 60 Park Pl., Newark, rejected bid 3 story, basement, 95 x 110 ft., brick, steel Rose St. and Belgrove Dr. $150,000. Harris & Sohn, 17 Mechanic St., Newark, archts. Noted Oct. 22.

N. J., Morristown — D. Allen, archt., 85 Harrison Ave., West Orange, bids about Dec. 15, general contract rebuilding 2 story, basement brick, steel hotel, Morris and King Sts., for Newmark & Schlosser, c/o archt. $150,000. Noted Sept. 24.

N. J., Mount Freedom—J. D. Allen, archt., 85 Harrison Ave., West Orange, rejected bids 2 story, basement, brick, steel hotel, for I. Saltz, Morris Plains Rd. $150,000. Noted Oct. 1.

N. J., Perth Amboy—See "Contracts Awarded."

N. J., Rutherford—See "Contracts Awarded."

N. J., West New York — See "Contracts Awarded."

N. Y., Arverne—See "Contracts Awarded."

N. Y., Astoria—See "Contracts Awarded."

N. Y., Jackson Heights — See "Contracts Awarded."

N. Y., Maspeth—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., New York—A. J. Schwarzler Co., 2432 Grand Concourse, bids about January, general and separate contracts 10 story, 1663 St. Nicholas Ave. $350,000. P. B. LaVelle, 41 East 42nd St., archt.

Pa., Pittsburgh—H. C. Severance, archt., 30 West 44th St., New York, receiving preliminary bids 8 story, basement, penthouse, brick, tile 20,000 sq.ft. floor space, Bayard and Amberson Sts., for Owner, c/o architect. $1,000,000.

CONTRACTS AWARDED

Md., Baltimore—Interstate Properties Corp. 551 5th Ave., New York, S. N. Bobo, in charge, residential development (100 acre village), separate contracts. $4,000,000.

N J. Bayonne—H. Zeik, 23 West 33rd St., 3 story, basement, brick, steel, West 33rd St. separate contracts. $150,000. C. Shilowitz, 26 Journal Sq., Jersey City, archt.

N. J., Jersey City—S. Giordano, 1881 Hudson Blvd., 5 story, basement, 50 x 100 ft. brick, steel, 55-57 Tonnelle Ave., separate contracts. $150,000. M. Kraut, 3010 Hudson Blvd., archt.

N. J., Perth Amboy—P. Ruderman, 115 Brighton Ave., 5 story, basement 50 x 125 ft., brick, steel, Gordon St., separate contracts. $150,000. C. Shilowitz, 26 Journal Sq., Jersey City, archt.

N. J., Rutherford — Suburban Apartment Co., J. Vinik, pres., 3988 Hudson Blvd., Union City, 3 story, basement, brick, steel, Chestnut St., separate contracts. $150,000. M. Kraut, 3010 Hudson Blvd. Jersey City, archt.

N. J., Springfield—M Dandrea, 2 story, basement, brick, steel apartment, store, 272-4 Morris Ave., separate contracts. $150,000. J. B. Beatty, 15 Sorth Reid St., Elizabeth, archt.

N. J., West New York — F. Weisberg, 402 10th St., 3 story, basement, brick, steel, 408-10 10th St., separate contracts. $150,000. Private plans.

N. Y., Arverne—Gold Theatre Co. Lawrence, 6 story, separate contracts. $150,000. M. Horn, Arverne, archt.

N. Y., Astoria — Greuech Constr. Corp., 402 New York Ave., Brooklyn, 4 story, 41st St. and 30th Ave., separate contracts. $150,000. S. Millman, 1780 Pitkin Ave., Brooklyn, archt.

N. Y., Auburndale — R. and E. Building Corp., 119-16 Hollis Ave., Hollis, apartment, separate contracts. $155,000. Private plans.

N. Y., Jackson Heights—Barwel Constr. Co. 40-9 81st St., 6 story, Austin St. and 63rd Dr., separate contracts. $450,000. W. Hohauser, 1431 Bway., New York, archt.

N. Y., Maspeth—Maspeth Realty Associates, 162 Remsen St., Brooklyn, apartment, vicinity Maurice and 53rd Aves., separate contracts. $150,000.

N. Y., New York—Corporation, c/o S. Lerner, 2043 Holland Ave., apartment, Austin Pl. and Holland Ave., separate contracts. $200,000. Lilien & Lilien, 645 East Tremont Ave., archts.

N. Y., New York—Raymore Constr. Co., 4756 3rd Ave., apartment, 210th St., separate contracts. $170,000. R. Gottlieb 4756 3rd Ave., archt.

N. Y., New York—S. A. I. Constr. Co., H. J. Griston, pres., 325 Riverside Dr., apartment, Bronx Blvd. and 216th St., separate contracts. $175,000. G. W. Swiller, 4215 3rd Ave., archt.

N. Y., New York — Tilwin Holding Corp., 1516 Nelson Ave., 6 story apartment, Grand Ave. and 182nd St., separate contracts. $200,000. Lilien & Lilien, 645 East Tremont Ave., archts.

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CLUBS

PROPOSED WORK

N. J., Jersey City—Owner, c/o C. Goldberg, archt., 921 Bergen Ave., sketches 2 story, basement, brick, steel club house, Fleet St. $150,000.

CONTRACTS AWARDED

Pa., Pittsburgh—L. H. Button, archt., Grant Bldg., 2 story, basement, 54 x 150 ft., brick, steel club house, to S. M. Wilson, Whitfield Bldg., for College Club of Pittsburgh. R. N. Davis, pres., 143 North Craig St., J. E. Nelson, chn. Building Comn., 201 North Murtland St. Est. $150,000. Noted Feb. 5.

HOSPITALS

PROPOSED WORK

Mich., West Branch—Childrens Tuberculosis Hospital, c/o architects office, plans by Bounah & Chaffee, 523 Barium Tower, Detroit, 1 and 2 story, basement, 99 x 580 ft. and 92 x 151 ft., brick, rein.-con. steel hospital buildings, plain founds. $650,000.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids in April, general contract 11 story, 136 x 335 ft. nurses training school, at Kings Co. Hospital, Albany and Clarkson Aves. $1,625,000. L. P. Ward, 205 East 42nd St., New York, archt. Noted July 9.

Tex., Beaumont—Sisters of Charity of Incarnate Word, Beaumont and Houston, plans by M. J. Sullivan, 4301 Main St., Houston, and Beaumont, and bids before Jan. 1, brick, rein.-con. addition to Hotel Dieu Hospital, nurses home, chapel, sister's home, hospital wing and remodeling work. $500,000. Noted Mar. 5.

Tex., San Antonio—City, c/o C. M. Chambers, mayor, and Bexar Co., W. A. Wurzback, judge, plans by Phelps & DeWees, 630 Gunter Bldg., remodeling and constructing 4 story, basement, steel, rein.-con., brick, tile, stone hospital addition, 515 Morales St. $150,000.

Wash., Seattle—B. H. Moe, archt., Vance Bldg., Seattle, soon takes bids general contract 4 story, basement, brick hospital with two 3 story wings, Woodland Park Ave., for Norwegian Hospital Assn., Mrs. G. Lund, pres. $250,000.

BIDS ASKED

Mass., Boston—Massachusetts Memorial Hospital, 82 East Concord St., taking bids altering and reconstructing Robinson Memorial Building, 4 story, basement, brick, steel, plain found., 6 Stoughton St. $150,000. Kendall, Taylor & Co., 209 Columbus Ave., archts.

N. J., Jersey City—Bd. City Comrs., Court House, bids about Dec. 1, Psychopathic Hospital, 15 story, basement, brick, steel, Baldwin and Montgomery Sts. $750,000. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted May 28.

O., Lima—Dec. 1, by City, memorial hospital. $500,000. Thomas D. McLaughlin Co., Lima Trust Bldg., archts. Noted Oct. 1.

Pa., Pittsburgh—Nov. 24, by P. C. Dowler, archt., Century Bldg., 8 story, basement, brick, tile hospital, South 20th and Jane Sts., for South Side Hospital, J. E. Roth, pres. $2,000,000. S. S. Goldwater, 1212 5th Ave., New York, consult. archt. Noted Sept. 10.

CONTRACTS AWARDED

Ind., Batesville—Hillenbrand Estate, c/o Sisters of St. Francis, general contract 3 story, basement, 40 x 150 ft., rein.-con., brick hospital, to W. A. Gutzwiller, Batesville. Est. $150,000. Noted Oct. 1.

Wash., Seattle—Owner, c/o C. Hay, Pantages Bldg., 5 story, basement, rein.-con., 40 x 112 ft. hospital, to T. J. Madlen, 1005 North 62nd St. Est. $150,000.

CHURCHES

PROPOSED WORK

Ga., Atlanta—Druid Hills Methodist Church, c/o R. De Witt King, chn., plans by Ivey & Crook, Candler Bldg., church, Seminole St. and Blue Ridge Ave. $300,000.

Mass., Holyoke—Blessed Sacrament Parish, M. P. Kavanagh, pastor, brick, stone church, Northampton and Westfield Rd. $150,000. Architect not appointed.

N. J., Morris Plains — Presbyterian Church, 55 Park Pl., plans by C. L. Bolton, Schaff Bldg., Phila., Pa., 2 story, basement, brick, steel church. $150,000.

N. J., Paterson—St. Ann's Church, C. A. Anid, pastor, 235 Mill St., plans by J. T. Foiks, 488 East 33rd St., altering and constructing 2 story, basement, brick, steel addition, Marshall St. $150,000. **Maturity indefinite.** Noted Nov. 5.

N. J., Secaucus—Ansche Sholem Congregation, J. Pollack, in charge, 71 2nd St., 2 story, basement, brick, steel temple, Roosevelt Ave. and 3rd. St. $150,000. **Maturity probably soon.**

BIDS ASKED

Mass., Pittsfield—Sacred Heart Church taking bids 1 story, basement, brick, stone, plain found. $150,000. J. W. Donahue, 1200 Main St., Springfield, archt.

N. J., Bayonne—Hudson Co. Parental School, 1241 Hudson Blvd., Jersey City, bids about Jan. 15, general contract 2 story, basement, brick, steel chapel, garage, Hudson Blvd. $150,000. C. Ziegler, 26 Journal Sq., Jersey City, archt. Noted Oct. 22.

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CONTRACTS AWARDED

Me., Waterville—Christian Church, 1 story, basement, brick, stone, plain found., to C. T. Reynolds, 217 Water St., Augusta. Est. $150,000.

Md. Baltimore — Frohman, Robb & Little, archts., 726 Jackson Pl., Wash., D. C., 2 story, 80 x 164 ft., local stone, cut limestone, tile, marble, iron, steel, hollow tile, brick, rein.-con. slab church, to M. A. Long Co., 10 West Chase St., for Protestant Episcopal Church, A. C. Powell, chn., Stoney Run and University Parkway. $175,000. Noted Oct. 22.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—Bd. Educ. sketches by G. M. Lindsey, 609 Union Insurance Bldg., John Marshall High School, 12 unit classroom, auditorium, Tracy and George Sts. $200,000. D. S. Reynolds, 756 South Bway., mechanical engr. Noted May 28.

Calif., Rio Linda—Grant Union High School Dist., sketches high school. Election $300,000, for same.

Calif., Sacramento—Sacramento School Dist. plans by W. Coffman, Forum Bldg., C. Dean and H. Devine, California State Life Bldg., 3 Junior High School buildings. $1,146,000 bonds voted for same.

Calif., San Francisco—Sisters of Sacred Heart, 1100 Franklin St., plans by H. A. Minton, 525 Market St., rein.-con. college building, Turk St. $300,000.

Conn., Darien—Town, Bd. Educ., E. B. Fuller, supt., Renshaw Rd., plans by John N. Pierson & Sons, 198 Jefferson St., Perth Amboy, N. J., and takes bids about Nov. 15, general contract 2 story, basement, brick, rein.-con., steel grade school, plain found. $150,000. Noted Oct. 15.

Conn., Greenwich—Town, J. W. Curtiss, Bd. Educ., plans by Guilbert & Betelle, 20 Branford Pl., Newark, N. J., brick, steel high school addition, Field Pt. $150,000.

Conn., Greenwich—Town, J. W. Curtiss, Bd. Educ., receiving competitive sketches until Nov. 14, new Riverside School. $150,000 or more.

Ga., Emory University — Emory University, c/o A. Cox, J. McCork, athletic dir., plans by Hentz, Adler & Shutz, 1330 Candler Bldg., Atlanta, and takes bids latter part November, 2 story, rein.-con., structural steel, tile, brick gymnasium building on campus. $200,000. Noted July 9.

Ind., Ft. Wayne—Bd. Educ. plans by Pohlmeyer & Pohlmeyer, 260 Central Ave., 2 story, basement, E shaped, incl. auditorium. $175,000. Architect not appointed.

Mass., Boston—Boston College, J. H. Dolan, pres., College Rd., Chestnut Hill, Newton, law school, Beacon Hill. To exceed $150,000. Architect not appointed.

Mass., Easthampton—Town, E. B. Gaylor, chn. school buildings, brick high school, $150,000. Architect not appointed.

N. J., Elizabeth — Bd. Educ., 417 South Broad St., sketches by H. B. Brady, Inc., 333 North Broad St., 2 story, basement, brick, steel, rein.-con., 2nd Ward sect. $150,000.

N. J., Jersey City—Bd. Educ., Administration Bldg., sketches by J. T. Rowland, Jr., 30 Journal Sq., Truants' School, 2 story, basement, brick, steel, rein.-con., rear State Normal School. $150,000. Noted Oct. 29.

N. J., Middlesex—Bd. Educ., Watchung School, sketches by J. N. Pierson, 198 Jefferson St., Perth Amboy, 2 story, basement, brick, steel, Ramsey Lane and Virginia Ave. $150,000. Noted Oct. 29.

N. J., North Bergen—Bd. Educ., Township Hall, 3 story, basement, brick, steel, rein.-con. high school. $150,000. **Maturity indefinite.** Architect not appointed.

N. J., North Plainfield—Bd. Educ., 125 Somerset St., 2 story, basement, brick, steel, rein.-con. school. $150,000. **Maturity soon.** Architect not appointed.

N. J., Oceanport—Bd. Educ. sketches by F. G. Nobbe, 1630 Springfield Ave., Maplewood, 2 story, basement, brick, steel school. $150,000. Noted Oct. 15.

N. J., Passaic — Bd. Educ., R. D. Benson, pres., Hobart Bldg., new sketches by J. F. Kelly, Post Office Bldg., and bids about February 2 story, basement, brick, steel, rein.-con. high school addition, Lafayette Ave. $750,000. Noted July 3.

N. J., Roselle—Bd. Educ., M. Williams, pres. Chestnut St., 2 story, basement, brick, steel, 1st and 2nd Aves. $150,000. **Maturity soon.** Architect not appointed.

Tex., San Antonio—Emmet T. Jackson, Builders Exch. Bldg., bids within 60 days, Junior-Senior Colored School, 2 story, 110 x 190 ft., brick, rein.-con., plain found., Montana, Grimes, East Commerce and Rio Grande Sts. $150,000. Phelps & DeWees, Gunter Bldg., archts. W. Simpson, Milan Bldg., engr. Noted Oct. 1.

Ont., Hamilton—Plans by B. H. Prack, 1311 Pigrott Bldg., brick concrete, steel commercial school, Sanford Ave. $500,000.

Que., Montreal — Montreal Catholic School Comn., c/o J. Castain, secy., 117 St. Catherine St. W., school for crippled children, north end city. $300,000.

BIDS ASKED

Calif., Pasadena—Nov. 20, by California Institute of Technology, 1201 East California St. (from selected list of contractors), 3 story, basement, 56 x 125 ft., rein.-con., stucco, stone, tile, concrete steel, ornamental iron, chemistry building addition 1201 East California St. Mayers, Murray & Phillips, and B. G. Goodhue Associates, 2 West 47th St New York City, archts. $300,000.

Calif., Pasadena—Nov. 20, by California Institute of Technology, 1201 East California St. (from selected list of contractors), 3 story, basement, 56 x 190 ft., rein.-con., stucco, stone, steel sash, ornamental iron addition to Biological Building, 1201 East California St. $300,000. B. G. Goodhue Associates, and Mayers, Murray & Phillips, 2 West 47th St. New York, archts. Noted Sept. 10.

Del., Delaware City—Nov. 17, by State School Building Comn., H. V. Holloway, supt. Dover, two 1 story, basement, brick, steel high school wings, plain founds. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts.

Mass., Wellesley—Wellesley College, C. B. Hodgate, supt., taking bids 4 story, basement, irregular sized, brick, steel, co-operative dormitory, plain found. $150,000 or more. W. T. Aldrich, 30 Newbury St., Boston, archt. Noted Oct. 22.

Mo., Kansas City—Nov. 19, by Bd. Educ., G. C. Tinker, secy., general contract rein.-con. brick high school addition, incl. gymnasium, auditorium, 20th St. and Van Brunt Rd. $400,000. N. W. Downes, 317 Finance Bldg., mechanical engr. C. A. Smith, 800 Finance Bldg., archt. Noted Nov. 5.

N. J., Bordentown—Dec. 1, by State Educ. Bd., 2½ story, basement, 65 x 160 ft. boys dormitories at Manual Training and Industrial School for Colored Youth. $200,000. Guilbert & Betelle, Chamber of Commerce Bldg., Newark, archts. Noted Sept. 3.

N. Y., Clinton—Bd. Educ. bids about Dec. 7 general contract Central High School, $300,000. A. F. Gilbert, 358 5th Ave., New York, archt. Noted Oct. 8.

N. Y., New York—Nov. 16, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, P. S. 95, Sedgwick Ave., between Norman and Gouverneur Aves., for Bd. Educ., 500 Park Ave. Noted Oct. 1.

Pa., Downingtonon—Nov. 19, by Bd. Educ., E. Smedley, pres., 2 story, basement, 115 x 225 ft. rein.-con., brick, steel high school, plain found. J. H. Mowere, Phoenixville, archt. Noted May 28.

Pa., Pittsburgh—Nov. 17, by Bd. Educ., H. W. Cramblet, secy., Administration Bldg., Westinghouse High School, brick, steel, North Murtland St. $239,000. Ingham & Boyd, Empire Bldg., archts. Noted Mar. 12.

Tex., College Station — See "Contracts awarded."

CONTRACTS AWARDED

Ala., Tuskegee — Tuskegee Institute, 16 Cooper Sq., R. R. Moran, pres., A. Taylor in charge, Thomas A. Edison Science Building, to T. C. Windham Sons, 1620 4th Ave. N., Birmingham. Noted June 4.

Del., Wilmington—State School Building Comn., H. V. Halloway, supt., Dover, altering and constructing Junior High School, 2 story, 102 x 190 ft., brick, steel, rein.-con. plain found., to Cantera Constr. Co., Penna. Ave. and Clayton St., $131,500; plumbing and heating, to C. L. Pierce & Co., 3 Concord Ave., $32,995; electrical work, to A. H. McDaniel, 825 Shipley St., $7,250. Grand total $171,745. Noted Oct. 22.

Ill., Elgin — Bd. Educ., general contract 2 story, ground floor, 150 x 158 ft., rein.-con., brick, terra cotta, incl. gymnasium, kindergarten, to Vagtborg Constr. Co., 251 West 79th St. Chicago, $144,500; plumbing, to W. J. King & Co., Elgin, $9,819; heating and ventilating, to Carstens Bros., Ackley, Ia., $26,684; wiring, to C. Marker, Elgin, $7,785. Grand total $188,788. Noted Oct. 15.

Md., Glenburnie — Public School Building Comn., State House, Annapolis, 2 story, basement, 86 x 90 ft., brick, hollow tile, cut stone steel, iron high school, to S. B. Dove, Annapolis, $150,000.

Mass., Dedham—Town School Bd., altering and constructing 2 story, basement, brick, steel high school addition, plain found., to J. A. Singarella, Park Sq. Bldg., Boston. Est. $300,000. Noted Oct. 1.

Mass., Medford—City, A. J. Harty, City Hall, 8 room grade school, Sharon and Holton Sts., and 6 room grade school, Governors Ave., both brick, to Wm. T. Dinneen Constr. Co., 14 Central Ave., Lynn. Est. $157,000. Noted Aug. 27.

Mass., Roslindale (sta. Boston)—City of Boston, Dpt. School Buildings, 2 story, basement, brick, stone, steel school, plain found., Charles Sumner Dist., to Rugo Constr. Co., 80 Boylston St., Boston. Est. $175,000. Noted Oct. 8.

Mass., Winchester—Town, R. M. Stone, chn. Building Comn., altering and constructing 2 story, basement, irregular sized, brick, stone, high school addition, plain found., Main St. and Mystic Valley Parkway, to I. P. Rocheford, 24 Union Ave., Framingham. Est. $200,000. Former contract rescinded. Noted Oct. 1, under "Contracts Awarded."

N. J., Trenton—State Educ. Bd., general contract 2 story, basement, 126 x 132 ft. brick, steel, to Karno-Smith Co., Broad St. Bank Bldg.

Schools (Continued)

$145,000; iron and steel, to N. A. K. Bugbee, 204 East Hanover St., $16,538; heating nad ventilating, to W. E. Bittner, 2015 Hamilton Ave., $30,980; electrical work, to Mercer Electric Co., 338 South Broad St., $7,000; plumbing, to A. Race, Elizabeth, $25,539. Grand total $225,057. Noted Oct. 22.

N. J., Westfield—Bd. Educ., Clark St., general contract 2 story, basement, brick, steel addition, to McKinley School, to M. Riesz, 307 Smith St., Perth Amboy; plumbing and heating, to Burns, Lane & Richardson, 1107 Broad St., Newark; electrical work, to C. N. Taylor, 15 East Elizabeth Ave., Linden; steel and iron, to Harco Steel Co., 1180 East Broad St., Elizabeth. Est. $150,000. Noted Oct. 22.

N. Y., Fairmount—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, general contract assembly hall, Syracuse State School, to W. J. Murray Constr. Co., 41 South Pearl St., Albany, $74,500; heating and sanitary work, to F. Group & Son, 607 North Salina St., Syracuse, $9,489 and $3,629 respectively; electrical work, to Doster & Egan, 204 Erie Blvd. E., Syracuse, $3,850. Grand total $91,468. Noted Sept. 24.

O., Hamilton—Bd. Educ., C. Hohlfelder, clk., Woodrow Wilson Junior High School, 3 story, brick, rein.-con., plain found., to F. K. Vaughn Building Co., Hamilton, $261,600; heating and ventilating, to H. J. Osterfeld, 413 South Main St., Dayton, $51,777; electric wiring, to C. Pfotzer, Hamilton, $16,920. Grand total $330,-297. Noted Oct. 1.

Tenn., Knoxville—University of Tennessee, H. A. Morgan, pres., general contract rein.-con., brick, tile, steel, limestone university, to A. H. Whisman, 422 Front St., $232,392; plumbing and heating to J. A. Redmond, Knoxville, $38,000; electric wiring, to Warner Electric Serv. Co., 102 West Clinch Ave., $8,700. Grand total $279,092. Noted Sept. 17.

Tenn., Nashville—Bd. Educ., A. E. Hill, chn., Hume Gogg Bldg., general contract East Nashville Senior High School, 3 story, basement, L shaped, 78 x 261 ft. and 100 x 103 ft., concrete, brick, stone, incl. shops, music hall, library, auditorium, gymnasium, to V. L. Nicholson Co., Independent Bldg., Nashville, and 102 West Clinch Ave., Knoxville, $323,770; concrete stadium, to J. B. Regen, 127 5th Ave. N., $30,079. Noted Aug. 27.

Tex., College Station—State, A. & M. College Station, 3 story, 60 x 110 ft., brick, rein.-con., plaster on tile interior petroleum engineering and geology building, plain found., 3 story, 80 x 120 ft., brick, stone, rein.-con., steel agricultural engineering building, plain found., day labor, $200,000 each. Owner to purchase materials and let sub-contracts and equipment. F. E. Giesecke, College Station, archt.

Wis., Stevens Point — St. Peters Catholic Church, c/o J. Chylinski, pastor, 2 story, basement, 148 x 165 ft., rein.-con., brick school, to F. G. Bartell, St. Cloud. Est. $160,000.

Que., Montreal — Montreal Catholic School Comn., 117 St. Catherine St. W., school, Darling St., to Frenette Freres Ltd., 2123 Des Carrieres St., $147,986.

Que., Montreal—Montreal Catholic School Comn., 117 St. Catherine St. W., 3 story, basement, 65 x 175 ft., concrete, stone, brick concrete founds., Dumas St., to J. A. A. Leclair Dupuis, Ltd., 620 Cathcart St., $147,380.

THEATRES

PROPOSED WORK

N. J., Newark—Salmond Schrimshaw & Co., archts., 526 Elm St., Arlington, soon takes new bids theatre and store, Market and Ward Sts., for Fleisner Realty Co., c/o architect. $150,000. Former bids rejected. Noted Oct. 15.

R. I., Providence—J. Conn, 368 Friendship St., soon lets contract brick, steel theatre, store, Broad and Chestnut Sts. $150,000. O. DiSais, 825 Hospital Trust Bldg., archt. Noted May 28.

Que., Montreal — Confederation Amusements, 1449 St. Alexander St., plans by R. Charbonneau Ltd., 360 Sir George Etienne Cartier Sq., theatre. Noted Apr. 9.

CONTRACTS AWARDED

Tenn., Nashville — Marr & Holman, archts., Stahlman Bldg., general contract 12 story, basement, 91 x 242 ft., concrete, brick, steel, marble, stone theatre, office, store and garage building, for Warner Brothers Pictures, Inc., 321 West 44th St., New York, to G. A. Zimmerman Corp., 19 East 41st St., New York and Sumner Constr. Co., Sumner Bldg., Nashville, $600,000. Total est. $1,250,000. Noted Sept. 17.

BANKS

BIDS ASKED

N. J., Newark—W. E. Lehman, archt., 972 Broad St., taking bids general contract 2 story, basement, brick, steel bank, Market St. and Raymond Plaza for Marzano State Bank & Trust Co., 15 Ferry St. $150,000. Noted Oct. 22.

CONTRACTS AWARDED

Me., Brunswick—W. F. Senter, 124 Maine St., 2 story, basement, brick, stone, steel, marble bank, store, concrete found., to Naugler Bros. Co., Inc., 117 Maine St. Est. $150,000. Noted Nov. 5.

N. Y., Brooklyn—Brevoort Savings Bank, 522 Nostrand Ave., bank addition, to William Kennedy Constr. Co., 215 Montague St, Noted Oct. 22.

Tex., Tyler—Peoples National Bank, 15 story bank, to American Constr. Co., Rusk Bldg., Houston, $300,000. Noted Oct. 8.

OFFICES

PROPOSED WORK

Del., Wilmington—Delaware School Foundation, A. J. Taylor, vice-pres., Du Pont Bldg., revised sketches by Guilbert & Betelle, 20 Branford Pl., Newark, N. J. and takes bids about Jan. 15, general contract 2 story, basement, brick, steel office, plain found. $150,000. Noted Mar. 5.

Mass., Springfield—Gibralta Garage & Office Co., W. A. Dunne, Highland Hotel, plans by L. S. Joslin, 339 Newbury St., Boston, 8 story, 200 x 205 ft., brick, steel office, garages, Vernon St. and Columbus Ave. $1,000,000.

N. J., Westfield—Elizabethtown Consolidated Gas Co., 16 West Jersey St., Elizabeth, soon lets general contract 1 and 2 story, basement, brick, steel office, store. $150,000. Private plans.

CONTRACTS AWARDED

N. J., East Orange—E and M Holding Corp., J. English, pres., 561 Main St., general contract office, store, Harrison St., to Kuskin & Rotberg, 139 North Arlington Ave. Est. $150,000.

Tenn., Nashville—See "Theatres."

STORES

PROPOSED WORK

N. J., New Brunswick — J. Lefkowitz, 333 Handy St., taking bids 2 story, basement, brick, steel store, office, French and New Sts. $150,-000. H. G. Bach, 63 Schureman St., archt.

BID ASKED

N. J., Newark—Owner, c/o Harris & Sohn, archts., 17 Mechanic St., bids about Dec. 15, general contract 2 story, basement, brick, steel, store, apartment. $150,000.

N. J., Westfield—Owner, c/o H. V. Trevenen, archt., 116 Elm St., bids about Nov. 15, general contract 2 story, basement, brick, steel store, office, East Broad St. $150,000. Noted Oct. 15.

N. Y., Long Island City — See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Long Island City — Manson Realty Corp., 2nd and Ditmars Aves., 6 story, store, apartment, Bway. and 47th St., separate contracts. $210,000. M. Klein, 2nd and Ditmars Aves., archt.

PUBLIC

PROPOSED WORK

N. J., Union — TOWN HALL — Township Com., Twp. Hall, sketches by F. A. Elsasser, 1000 Stuyvesant Ave., 2 story, basement, brick, steel, rein.-con., Union Center. $150,000.

N. Y., Ithaca—COURT HOUSE—Bd. Supervs. Thompkins Co., court house. $500,000.

Ore., Tillamook—COURT HOUSE—Tillamook Co. court house, 3rd St., 4th and 5th Aves. $160,000. Architect not appointed.

R. I., Pawtucket—HOME—City, Dpt. P. Welfare, C. W. Green, City Hall, city home. $150,-000 or more. Architect not appointed.

Tenn., Lawrenceburg—ORPHANS' HOME—Bd. Supervs. Lawrence Co., J. W. Springer, judge, sketches concrete, brick orphans' home. $150,000—$200,000.

BIDS ASKED

Calif., San Francisco—WAR MEMORIAL and OPERA HOUSE—Nov. 17, by San Francisco War Memorial Trustees, ornamental iron work for war memorial and opera house, Civic Center, for City and San Francisco Co. Total est. $5,000,000. Noted Oct. 1.

Mass., Belmont—DORMITORY—Nov. 18, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 3 story, basement, brick, stone employees dormitory, plain found., at State School. $150,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts. Noted Sept. 24.

Mass., Boston—OFFICE—Dec. 1, by Dpt. P. Wks., 8 story, basement, brick, steel office, Nashua St., for Commonwealth of Massachusetts, $1,500,000. E. T. P. Graham, 171 Newbury St., archts. Noted Oct. 22.

Mass., Tewksbury—EMPLOYEES—Nov. 18, by Dpt. P. Welfare, Commonwealth of Massachusetts, State House, Boston, 2 story, basement, irregular sized, brick, stone, steel, plain found., at State Infirmary. $150,000. Putnam & Cox, 114 State St., Boston, archts.

Mass., Wrentham — DORMITORY — Nov. 18, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 3 story, basement, brick, stone, steel employees dormitory, plain found., at State School. $150,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, archts. Noted June 25.

North Carolina—PRISON CAMPS—See "Contracts Awarded."

Tex., Big Springs—CITY HALL and FIRE STATION—Nov. 18, by City, c/o M. Stewart, secy., brick, stone, steel, rein.-con., $200,000. Peters, Strange & Bradshaw, Big Springs, archts.

CONTRACTS AWARDED

N. J., East Orange—FIRE HEADQUARTERS—Bd. City Council, City Hall, general contract 2 story basement, brick, steel, to Standard Constr. Co., 94 Boyland St., Newark; plumbing, to Ruehl & Hatfield, 384 South 10th St., Newark; heating, to Mills & Brown Co., 145 Main St.; electrical work to Davis Electric Co., 15 Central Ave., Newark; steel, to J. E. Brooks & Co., Mulberry St., Bloomfield. Est. $150,000. Noted Oct. 22

N. Y., Jamaica — COURT HOUSE — G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., Long Island City, general contract children's court house, to O'Driscoll & Grove, 415 Lexington Ave., New York, $155,500; plumbing, to Weber & Hamilton Co., Inc., 25-23 23rd St., Astoria, $12,287; heating, to G. J. Tanzer, Inc., 327 West 43rd St., New York, $13,679; electrical work, to J. L. Goodrich, 205 East 42nd St., New York, $4,500; elevator, to Otis Elevator Co., 11th Ave. and 26th St., New York, $4,070. Grand total $190,036. Noted Oct. 29.

N. Y., Thiells — BARNS — Comr. Mental Hygiene, State Office Bldg., Albany, general contract farm barns, at Letchworth Village, to Perlman & Wortmann, 116 Lexington Ave., New York, $196,000; heating, to Astoria Heating Co., Woodside, $9,600; sanitary work, to J. Boyd Plumbing & Heating Co., 328 East 33rd St., New York, $12,875; electrical work, to Dropkin Bros., Inc., 536 Bushwick Ave., Brooklyn, $6,775. Grand total $225,250. Awarded in October. Noted Sept. 3.

North Carolina—PRISON CAMPS—State Hy. Comn., Raleigh, 8 or 10 fireproof prison camps for convicts on maintenance work, incl. water and sewer facilities for each camp, plumbing, heating, own forces. $150,000. L. R. Ames, Raleigh, engr.

O., Cleveland—EXHIBITION HALL—City, D. E. Morgan, mgr., 1 story, 388 x 412 ft., concrete, steel underground exhibition hall, Lakeside Ave., to Sam W. Emerson Co., 1836 Euclid Ave., $1,162,000.

UNCLASSIFIED

PROPOSED WORK

Calif., Santa Rosa—MAUSOLEUM—United Mausoleum Corp., c/o F. H. Slocombe, archt., 3830 Harrison St., Oakland, rein.-con., marble, bronze. $150,000.

Mass., South Hadley—LIBRARY—Williston Memorial Library, Main St., plans by G. F. Newton, 6 Beacon St., Boston, altering and constructing addition. $150,000.

N. J., Westwood — RAILROAD STATION — Erie R.R. Co., G. S. Fanning, ch. engr., 101 Prospect Ave. S. W., Cleveland, O., bids latter part month, general contract 2 story, basement, brick, steel railroad station. $150,000. Noted Nov. 5.

N. Y., New York — ART GALLERIES — Wildenstein Galleries, 647 5th Ave., bids in December or later, 5 story art gallery, 19 East 64th St. $300,000. H. Trumbauer, Land Title Bldg., Phila., Pa., archt. Noted Oct. 22.

Que., Montreal—MARKETS—Corporation of Montreal, have plans prepared for market in St. John's Ward, $300,000; addition to St. Antoine Market, $200,000; addition to Rachel St. Market, $800,000. Council has voted their share of the cost one half and are awaiting decision as to whether Province and Dominion Government will approve of the works as a relief measure and between them share other half of cost.

BIDS ASKED

Calif., Los Angeles—LAYMANS RETREAT—Dec. 1, by Layola Retreat Assn. (selected list of contractors), 3 brick, metal, steel buildings, incl. baths, showers, near Sunset Blvd. in Hollywood Hills. $150,000. R. Montgomery, 572 Chamber of Commerce Bldg., archt. Noted July 30.

O., Xenia—DINING HALL, etc.—Nov. 25, by Ohio Soldiers & Sailors Orphans Home, 1 story, brick, steel, concrete dining hall, kitchen, $160,000. Harsh, Davis & Rubrecht, 145 North High St., Columbus, archts.

CONTRACTS AWARDED

Ont., Ottawa — MAUSOLEUM — Catholic Episcopal Corp., St. Patrick St., 65 x 200 ft. marble exterior, bronze trim mausoleum, 400 crypt capacity, at Eastview, near here, to Canadian Mausoleum Ltd., Metropolitan Bldg., Toronto, $150,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ala., Mobile—PACKING PLANT—Swift & Co., 51 South Commerce St., 2 story packing plant, Congress and Magnolia Sts. $100,000. Private plans.

Calif., Berkeley—FACTORY—B. F. Sturtevant Co., 2530 6th St., sketches (1st unit) plant to manufacture ventilating apparatus, Gilman, Camelia, 8th and 9th Sts. $500,000.

Calif., Gilroy—CANNERY—Felice & Perelli plans by W. Knowles, 1214 Webster St., Oakland, 1 story, concrete. $40,000 or more.

Calif., Nubibler—LAUNDRY—Redding Laundries, Inc., Redding, sketches concrete brick laundry. $40,000. **Maturity spring 1932.**

Colo., Hillside—GOLD ORE MILL—Cloverdale Mines Co., c/o W. B. Porch, pres., Canon City, rebuilding 75 ton mill, destroyed by fire. $35,000-$50,000.

Ind., Elkhart — FACTORY — Illinois Carton Co., 2601 North Crawford Ave., Chicago, Ill., 1 story, 130 x 200 ft., brick, steel, Clark and Elkhart Sts. $40,000. Private plans.

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Factories and Mills (Continued)

Ind., Hammond—FACTORY—Lever Bros Co., Cambridge, Mass., plans by Stone & Webster, 49 Federal St., Boston, Mass., 4 story, basement, rein.-con., brick, stone addition. $1,000,000.

Mich., Detroit—FACTORY—Timken Detroit Axle Co., Clark Ave., altering, readjusting plant for manufacture Timken silent automatic oil burners. To exceed $40,000. Work will probably be done by day labor.

Miss., West Point — MILL — Aponang Mfg. Co., c/o S. W. Sanderson, pres. Jackson, soon lets contract 1 story, 107 x 200 ft., rein.-con., brick, steel sash. Robert & Co., Bona Allen Bldg., Atlanta, Ga., engrs.

Mo., Cabool—MILK PLANT—Pevely Dairy Co., Grand Blvd. and Chouteau Ave., St. Louis, sketches concrete, brick milk plant. $60,000.

N. Y., College Point—SHIPYARD—Corporation, c/o J. R. Thompson Agency, S. P. Bates, in charge, 8-23 Astoria Ave., Astoria, reconditioning and additions to shipyard. To exceed $40,000.

N. Y., Howard—GAS PLANT—Northern New York Utilities Corp., 58 Public Sq., Watertown, gas plant and main extensions.

N. Y., Long Island City — FACTORY — E. Eisnacker, 204 West 14th St., New York, plans by H. Feldman, c/o owner, 2 story, 50 x 100 ft. factory, 45th Ave. and 11th St. $40,000.

N. Y., Maspeth—FACTORY—Maspeth Realty Associates, 162 Remsen St., factory, Maurice and 53rd Aves. $110,000.

N. Y., New York—FACTORY—Corporation, c/o R. J. Marx, archt., 398 White Plains Ave., 2 story, 45 x 103 ft. factory, 239th St. and Bullard Ave. $40,000.

N. Y., New York — FACTORY — Superior Fireproof Door & Sash Co., 1811 Carter Ave., sketches by H. Ginsberg, 205 East 42nd St., 2 story, 50 x 100 ft. factory, Barnard and Barbour Sts. $40,000.

N. C., Greensboro — BOTTLING PLANT — Greensboro Coco Cola Bottling Co., c/o H. M. Draper, plans by Pringle & Smith, Norris Bldg., Atlanta, Ga., 2 story, rein.-con., structural steel, brick, tile, stone. $80,000.

Wis., Appleton—ICE CREAM PLANT—Appleton Pure Milk Co., 714 West Washington St., plans by Lee & Gmeinel, 601 West College Ave., 2 story, 48 x 50 ft. rein.-con., brick.

Ont., Hamilton—PLANT—Canadian Westinghouse Electric Co., N. S. Braden, engr., Hamilton, new additions to plant and installation new equipment. $250,000. Private plans.

Ont., Preston—PLANING MILL—J. Gillies rebuilding planing mill recently damaged by fire. $50,000 loss.

Ont., Ridgetown—FACTORY—Chain Plating Co., Richard St. at George St., J. Slasarchuk, genl. mgr., 1 story, 50 x 100 ft., brick.

Ont., Timmins—SAW MILL—Rudolph & McChesney, saw mill, incl. equipment. $50,000.

Ont., Walkerville — ICE CREAM PLANT — Walkerside Dairy Co., Monmouth Rd., W. R. Knowles, mgr., new ice cream plant. $150,000.

BIDS ASKED

Calif., Oakland—FACTORY—See "Contracts Awarded."

Calif., Ione—CREAMERY and DAIRY BARN —Nov. 24, by State Dpt. P. Wks., Division Architecture, Sacramento, two 1 story, rein.-con. buildings, for Preston School of Industry.

Ind., Vincennes—CORN MILL and GRAIN ELEVATOR—See "Contracts Awarded."

Me., Byron—MILL—Menderth, Inc., taking bids altering and constructing 2 story, brick timber addition. $50,000. R. Mayo, 465 Congress St., Portland, archt. Noted Nov. 5.

Mass., Watertown—LAUNDRY—E. J. Sancomb, 33 Thaxter Rd., Newtonville, taking bids 1 story irregular sized, concrete block laundry, incl. boiler plant. Acton St. $40,000. Wm. Haines & Son, 32 Riverview Ave., Waltham, archts.

N. J., Elizabeth — TALLOW FACTORY — Parkinson & Co., archts., 306 Montclair Ave., Newark, taking bids general contract 1 and 2 story, basement, 60 x 190 ft. brick, steel, Meadow Lane, for I. Schonwalter, Meadow Lane. $40,000. Noted Oct. 1.

N. J., Jersey City—ICE PLANT—C. Ziegler, archt., 26 Journal Sq., bids about Jan. 15, general contract 1 story, basement, brick, steel, rein.-con., for Mongiello Bros., 625 Communipaw Ave. $50,000. Noted Sept. 24.

N. Y., Brooklyn—PACKING PLANT—Stadley Eng. Co., engrs., 140 Liberty St., New York, taking bids packing plant, Johnson Ave. and White St., for Frank Wolk, Inc.

N. Y., New York—LAUNDRY—Hunts Point Wet Wash Laundry, Garrison and Longfellow Aves., bids about Dec. 1, general contract 1 story, basement, 100 x 100 ft. laundry, Garrison and Longfellow Aves. $40,000. H. Fenichel, 220 East 42nd St., archt. Noted Oct. 29.

Wis., Appleton — PLANT — Lee & Gmeinel, archts., 601 West College Ave., taking bids 2 story, 48 x 50 ft., brick, rein.-con., for Appleton Pure Milk Co., 714 West Washington St. Est. $40,000. Noted Nov. 12.

CONTRACTS AWARDED

Calif., Oakland—FACTORY—Clorox Chemical Co., 850 42nd Ave., steel, concrete addition, owner builds; steel, awarded to California Steel Co., 2nd and Harrison Sts. Est. $40,000.

Calif., San Diego—ICE MANUFACTURING PLANT—C. Gabriel, 661 E St., San Bernardino, 1 story, 50 x 107 ft., brick, concrete, to Olmstead Building Co., 2255 5th Ave. $40,000. Gay Eng. Corp., 2650 Santa Fe Ave., Los Angeles, will install machinery. Noted Nov. 5.

Ind., Vincennes—CORN MILL and GRAIN ELEVATOR—Orville Stout, brick, steel, 506 Bway., separate contracts. $50,000. Bacon & Tislow, 1015 Architects Bldg., Indianapolis, archts.

Ill., Chicago—BAKERY—Great Atlantic & Pacific Tea Co., 211 West Wacker Dr., 3 story, mezzanine, concrete, 51,000 sq.ft. floor space, incl. shipping and loading platforms, 47th and Kildare Sts., to E. W. Sproul Constr. Co., 2001 West Pershing Rd. Est. $150,000.

Mass., Westboro — FACTORY — Bay State Abrasive Products Co., O. S. Bucknam, supt., 2 story, 40 x 100 ft., brick, stone addition. $50,000. Owner builds. Private plans.

Mo., St. Louis—AUTO BODY PLANT—Kranz Automotive Body Co., 3032 Gravois Ave., 1 story, basement, concrete, brick, 3127-20 Minnesota Ave., to H. Dilschneider, Real Estate & Building Co., 7914 Kingsbury St.

N. J., Elizabeth—TALLOW FACTORY—Parkinson & Co., archts., 306 Montclair Ave., Newark, general contract 1 and 2 story, basement, brick, steel, to Drill Contg. Co., 60 Park Pl., Newark, for I. Schoenwalter, Meadow Lane. $40,000.

O., Cleveland — BAKERY — Jacob Laub Baking Co., J. Laub, pres., 4919 Lorain Ave., 2 story, basement, 50 x 130 ft., brick, rein.-con., 4919 Lorain Ave., to Boldt-Rapp Co., 2175 Ashland Rd. Est. $60,000.

Pa., Pottstown — LAUNDRY — See "Power Plants."

Wis., Kaukauna—PLANT—Thilman Pulp & Paper Co., M. E. Wertheimer, pres., 2 story, 60 x 95 ft., brick, rein.-con. plant and turbine room, to Permanent Constr. Co., 208 South La Salle St., Chicago, Ill. Est. $40,000. Noted Oct. 15.

Wis., Tomahawk—NEWSPAPER PLANT—Tomahawk Leader Co., 1 story, 40 x 60 ft., rein.-con., to F. Lemke, Clintonville, $40,000. Noted Oct. 15.

Wis., Wausau—FACTORY—Marathon Paper Mills Co., brick, rein.-con., to W. Anderes, 412 1st Ave.

GARAGES

PROPOSED WORK

Mass., Somerville—W. H. Greene, 73 Hinckley St., 1 story, brick, steel, concrete public garage, Bway. $55,000. Private plans.

N. Y., Brooklyn—M. H. Renken Dairy Co., 584 Myrtle Ave., bids after Nov. 16, general contract 2 story service garage and storage, Classon and Myrtle Aves. Koch & Wagner, 32 Court St., archts. $40,000. Noted Oct. 29.

N. Y., Maspeth—Maspeth Realty Associates, 162 Remsen St., Brooklyn, sketches 2 story, 100 x 200 ft. service garage, vicinity Maspeth and 53rd Aves. $100,000.

N. Y., New York—U. S. Trucking Corp., 17 Batetry Pl., sketches by P. Bardes, 230 Grand St., service garage, 41 East St. and Rivington Ave. $40,000.

N. Y., Ozone Park — Liberty Woodhaven Realty Co., 103-58 Woodhaven Blvd., plans by P. Freshman, 50 Court St., Brooklyn, service garage, Rockaway Blvd. and 93rd St. $40,000.

N. Y., Ozone Park—P. and W. Auto Co., Inc., 86th St. and Liberty Ave., sketches by C. Goodman, 375 Fulton St., Brooklyn, 100 x 100 ft. garage and repair shop, 86th St. and 103rd Ave. $40,000.

BIDS ASKED

Conn., Middletown—L. Combe, 12 Main St., taking bids rein.-con., brick, steel auto service garage, concrete found., Main and Williams Sts. $40,000. C. E. Segerberg, Barbard Rd., archts.

N. Y., Brooklyn—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Indianapolis—Highland Investment Co., general contract steel, stone super service station, 38th St. and Central Ave., to Brandt Bros., 611 Architects Bldg. Est. $40,000.

Minn., Virginia—Bd. Educ., H. O. Olson, clk., 3 story, 59 x 75 ft. garage and band hall, to Lenci & Lenci, Virginia. Est. $60,000.

N. Y., Brooklyn—E. Burak, 220 Meeker Ave., 100 x 140 ft. service garage, Meeker and Stewart Aves., day labor. $40,000. Soon takes bids on materials. M. Klein, 65 Court St., archt. Noted Oct. 29.

Tenn., Nashville—See "Theatres."

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Brooklyn — SHOP — Dpt. Hospitals, Municipal Bldg., New York, sketches by L. P. Ward, 205 East 42nd St., New York, service and repair shop, vicinity Clarkson Ave. and Albany St. $65,000.

BIDS ASKED

Conn., East Haven (br. New Haven)—See "Airports."

POWER PLANTS

PROPOSED WORK

N. Y., Woodhaven—Lalance & Grosjean Mfg. Co., 405 Lexington Ave., New York, 40 x 7[illegible] ft. boiler room, 92nd St. and 95th Ave.

Texas — West Texas Utilities Co., Abilene, electric power plant improvements, incl. transformer rack, 4-wire primary line, 2 mi. long, meter equipment, extension 2-wire single phase into Hillcrest addition, San Angelo; extension, replacements and enlargement to electric plant and waterworks systems at Stratford, Winter, Rising Star and Dalhart; extending 2 secondary lines from Mason to supply current at Roy Lee, Santa Ana and Coleman Junction, constructing transformer rack and extending primary line at Quanah. Private plans.

Pa., Pottstown—Hill School, J. T. Wendell, headmaster, general contract 1 and 2 story, basement, 53 x 134 ft., brick, steel power plant, laundry, plain found., to F. H. Keiser, 128 East 4th St.; power piping and plumbing to L. J. Sommer & Son, 2436 Brown St.; electrical work, to Burks Eng. Co., 6th and Chestnut Sts., Reading.

Wash., Okanogan—Okanogan Valley Power & Light Co. 6,500 hp. power plant on Similkameen River.

Ont., Renfrew—Town rebuilding Golden Lake Dam and constructing dam at Clear Lake for water regulation, concrete, timber crib construction, in connection with hydro-electric plant. $30,000. J. R. Stewart, Renfrew, engr.

BIDS ASKED

Miss., Jackson — Nov. 18, by Bd. Trustees Penal Farm, furnishing, installing complete power plant at Parchman Penal Farm at Parchman for State of Mississippi, Jackson. $70,000.

Tex., Borger—City, c/o J. R. Miller, mayor, taking bids municipal power and light plant, incl. generating station, distributing lines. $45,000. Address Owner.

CONTRACTS AWARDED

Mass., Gardner — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, Gardner State Colony, general contract 2 story, brick, steel power plant, to Proffit & White, 13 Oliver St., Fitchburg, $45,243; piping and equipment, to Holyoke Valve & Hydrants Co., 150 Race St., Holyoke, $43,502; electrical equipment, to Anderson-Coffey Co., 80 Boylston St., Boston, $7,775; coal handling equipment, to Jeffrey Mfg. Co., 141 Milk St., Boston, $2,310; boilers, to Combustion Eng. Corp., 80 Federal St., Boston, $11,410; boiler settings, to D. L. MacFarlane, 203 Jefferson St., Dedham, $9,215; stokers, to Riley Stoker Corp., 68 Devonshire St., Boston, $4,571; chimney, to M. W. Kellogg Co., 225 Bway., New York, $2,375. Grand total $126,401. Noted Oct. 22.

Mass., Webster—Webster Mills, L. C. Coats, Webster, 2 story, 54 x 55 ft., brick, steel, concrete power plant additions, East Main St., to C. S. Patten, 638 Main St., Melrose. Est. $40,000.

Minn., Emmons — Village general contract electric light and power plant, incl. distribution system, power house, to M. O. Hylbak, Emmons. Est. $90,000.

Minn., Kenyon—Village, distribution system, to Minneapolis Electric Constr. Co., 80 South 12th St., Minneapolis, $15,995; diesel engines, equipment, to Worthington Pump & Mchry. Corp., 1012 Pioneer Bldg., St. Paul, $67,952; power house, to Neitge Constr. Co., Mankato, $10,775. Grand total $94,722.

Ontario—Abitibi Power & Paper Co., 88 University Ave., Toronto, three 13,000 kva. and six 9,500 kva. transformers, in connection with hydro-electric power development on Abitibi River at Abitibi Canyon, to Canadian Westinghouse Co. Ltd., Metropolitan Bldg., Toronto. Total est. $20,000,000.

WAREHOUSES

BIDS ASKED

N. Y., Winfield—See "Contracts Awarded."

CONTRACTS AWARDED

N. Y., Winfield—V. Scudderi, 4009 82nd St., Jackson Heights 2 story, 90 x 100 ft. warehouse, factory, separate contracts and day labor. C. Stodolph, Elmhurst, archt. Sutro Products Co., premises, lessee. Noted Oct. 22.

Tex., Marshall—Marshall Cotton Oil Co., c/o W. C. Pierce, Marshall, 2 story, 50 x 160 ft., warehouse and plant, plain found., to F. Moos & Son, Marshall, $38,000; machinery, to E. B. Hayes Mchy. Co., Marshall, $12,000.

Wis., Madison—Frank Fruit Co., Madison, general contract 2 story, basement, 50 x 78 x 100 ft. brick, tile steel warehouse, to J. H. Findorff & Son, 601 West Wilson St.; excavation, to Quinn Constr. Co., 507 West Johnson St.; steel joists, reinforcing steel, sash, to Truscon Steel Co., 408 West Gorham St.; metal roof deck, to Howard Haskin, Madison; electrical wiring, to K. Loprich, 712 University Ave.; plumbing, to A. Metz, 113 West Mifflin St.; steel, to Wisconsin Bridge & Iron Co., 5023 35th St., Milwaukee.

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